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THE NORTH AMERICAN FREE-LIVING FRESH-WATER
NEMATODES.

CONTRIBUTIONS TO A SCIENCE OF NEMATOLOGY, II.
Eighty Illustrations

BY N. A. COBB.

INTRODUCTION.

The little creatures described in these pages belong to a very important but as yet comparatively little known class of animal organisms, the nematodes.

Something more than a mere reconnaissance leads to the conclusion that over nine-tenths of the nematode species still remain unknown, a greater disproportion between the known and the unknown than exists in almost any other class of organisms.

Nematodes are distributed far and wide in inconceivable numbers, and without doubt constitute a group in the animal kingdom comparable with insects both in number of species and economic importance. They vary in length from one two-hundredth of an inch to several feet, though the great majority are less than half an inch long. They differ from most other slender, wormlike forms in their lack of locomotive appendages,—the outer surface, except for the presence of setae, is usually quite smooth. Being more or less cylindrical in form, they are often called “round-worms.” They live free in the soil, in fresh and salt water, and are found parasitic in a great variety of animals and plants.

NEMATODES AS CAUSES OF DISEASE

The parasitic species often cause fatal diseases of plants and of animals, including mankind. The dreaded hookworm is a nematode. So is that scourge of the tropics, the guinea worm. *Trachina*,

costing civilized nations hundreds of thousands of dollars yearly for the inspection of pork, is a nematode. If trachina-infested or measly pork be eaten by human beings, the result is a serious, oftentimes fatal, sickness, called trichinosis, epidemics of which have claimed victims by the hundred. Nematodes have recently been suspected, with good show of reason, of being carriers of cancer. So the list of serious human nematode diseases might be increased until practically half a hundred had been enumerated.

No less serious are the nematode diseases of plants and of the lower animals. The common gall-worm has been found infesting the roots of several hundred different species of plants, among them most of our cultivated crops, and causes an annual loss amounting to millions of dollars. There is another nematode that has at times completely checked the growing of sugar beets in certain regions. The list of serious plant diseases of this character could easily be increased to scores. The same is true of animals. Every domestic, doubtless every wild, species has a number of specific nematode parasites sapping its vitality.

WONDERFUL VARIETY OF HABITAT.

Not the least interesting thing about nematodes is the astounding variety of their habitats. They occur in arid deserts and at the bottoms of lakes and rivers, in the waters of hot springs and in polar seas where the temperature is constantly below the freezing point of pure water. They were thawed out alive from Antarctic ice in the far south by members of the Shackelton expedition. They occur at enormous depths in Alpine lakes and in the ocean. As parasites of fishes they traverse the seas; as parasites of birds they float across continents and over high mountain ranges. Their eggs and larvae, invariably of microscopic size, are carried from place to place by an exceedingly great variety of agencies. Almost any visible thing that moves is capable of transporting nematode eggs or larvae. Sometimes the eggs and larvae are so resistant to dryness that if converted to dust they revive when moistened. This revival of mummified nematodes may take place after as long a period as a quarter of a century.

Nematodes are found in queer places. The wildest imagination could hardly outpicture the facts. One species is found prac-

tically only in the vermiform appendix of man; another has its adult form only in the seeds of wheat. A third form occurs in the felt mats on which the Germans are accustomed to set their mugs of beer, and has been found in no other habitat. On the feet of birds and insects the eggs, larvae, and adults of certain nematodes are carried to the tops of the tallest trees. The sour sap issuing from the wounds of a tree, often many feet above the ground, not infrequently contains nematodes that are specific to the wounds of that particular kind of tree. The tap water of even well-conducted cities often contains nematodes.

Nematodes are inconceivably abundant. A thimbleful of mud from the bottom of the ocean may contain hundreds of specimens. The number of nematodes in the top six inches of an acre of ordinary arable soil amounts to thousands of millions. Statistical calculations relative to the number of nematodes in a single acre of soil near San Antonio, Texas, U. S. A., disclosed that if they could start in a procession for Washington, D. C., two thousand miles away, each close on the tail of the one in front, the head of the procession would reach Washington before the rear had left San Antonio. As nematodes are usually very prolific, a single female sometimes producing thousands of eggs, the number of eggs vastly exceeds that of the adults.

We must therefore conceive of nematodes and their eggs as being carried by the wind, and by flying birds and running animals; as floating from place to place in nearly all the waters of the earth; and as shipped from point to point throughout the civilized world in vehicles of traffic.

There are beneficial nematodes, though knowledge of this phase of the subject is in its earliest infancy. Some nematodes feed exclusively on their injurious brethren. Others devour baneful micro-organisms. Their adaptations and relationships appear to be similar to those of insects.

NORTH AMERICAN FRESH-WATER SPECIES.

The nematodes here described are the main portion of those found during a rather casual search for aquatic species that would serve as the basis of a special chapter in a zoological textbook devoted to fresh water organisms. The object of the textbook was

to characterize each known genus by describing and illustrating a typical species.

When the work on the nematode chapter was begun there was hardly a single adequately described North American species, so that the initial task was one of pure discovery. This was followed by the work of research and definition, and this finally by that of selection and presentation of typical species in a manner suitable to a college textbook.

The famous Philadelphian, Dr. Joseph Leidy, appears to be the only naturalist who had previously attempted to describe any of our fresh water nematodes, and even he did but little. I have attempted to rehabilitate his *Anguillula longa*, which, as Bastian surmised, belongs to the more modern genus *Trilobus*. I have had to assume that the variety Leidy had before him was that most common in the ditches, brooks and rivers of the Chesapeake region, and have given to this form the name *Trilobus longus* (Leidy) Bastian.

All the other species proved to be new, some of them representatives of new genera. Most of the new genera have already been described in my contribution to the Proceedings of the Washington Academy of Sciences, October, 1913.

An aquatic species as here defined is any species inhabiting either fresh water, or non-brackish swampy soil below the water table; hence a species that will not drown in fresh water; a species fitted to utilize oxygen dissolved in fresh water.

Including those of the present article, the fresh water North American species so far described are as follows:

<i>Achromadora minima</i>	<i>Cyatholaimus truncatus</i>
<i>Actinolaimus radiatus</i>	<i>Diplogaster fictor</i> , Bastian
<i>Alaimus simplex</i>	<i>Dolichodorus heterocephalus</i>
<i>Anonchus monhystera</i>	<i>Dorylaimus fecundus</i>
<i>Aphanolaimus minor</i>	<i>Ethmolaimus americanus</i>
<i>Aphanolaimus spirurus</i>	<i>Iota octangulare</i>
<i>Bastiana exilis</i>	<i>Ironus americanus</i>
<i>Cephalobus setosus</i>	<i>Mesomermis virginiana</i>
<i>Cephalobus subelongatus</i>	<i>Microlaimus fluvialis</i>
<i>Chronogaster gracilis</i>	<i>Monhystera sentiens</i>
<i>Cryptonchus nudus</i>	<i>Mononchus similis</i>

<i>Oncholaimus punctatus</i>	<i>Spilophora canadensis</i>
<i>Plectus tubifer</i>	<i>Teratocephalus cornutus</i>
<i>Prismatolaimus stenurus</i>	<i>Trilobus longus</i> (Leidy), Bastian
<i>Rhabditis punctatus</i>	<i>Tripyla lata</i>
<i>Rhabdolaimus minor</i>	<i>Tylenchus symmetricus</i>

There has been little time or opportunity to search specially for these fresh water forms, and the fact that it has been possible in so short a time to assemble so many genera and species is proof of the enormous abundance and multifarious nature of these organisms. No doubt there is a horde of species awaiting discovery in North American waters.

THE NEMATODE FORMULA.

The following diagram illustrates the nature of the formula used in the tabulation of the various necessary measurements:

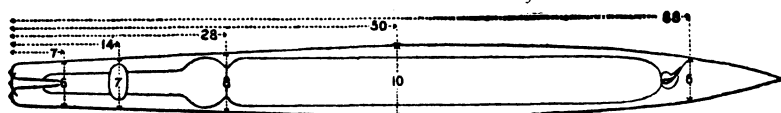


Fig. 1. Diagram of the descriptive decimal formula used for nematodes; 6, 7, 8, 10, 6 are the transverse measurements, while 7, 14, 28, 50, 88 are the corresponding longitudinal measurements. The formula in this case is:

7.	14.	28.	50.	88.
6.	7.	8.	10.	6.

The unit of measurement is the hundredth part of the length of the body, whatever that may be. The measurements become, therefore, percentages of the length. The absolute length is given in millimeters as a final non-paired term. This decimal method of presenting the measurements is the most compact and convenient method, and is being used more and more year by year.

The measurements are taken with the animal viewed in profile; the first are taken at the base of the pharynx, the second at the nerve-ring, the third at the cardiac constriction or end of the neck, the fourth at the vulva in females and at the middle (M) in males, the fifth at the anus. The formulae represent the average of several specimens whenever possible.

There are several methods of securing the measurements, one of the most convenient being the preparation of a camera lucida "skeleton" to scale, consisting of a line following the body axis

from one end to the other, and diametral lines at the base of the pharynx, the nerve-ring, the end of the neck, at the vulva in females and at the middle in males, and finally at the anus. This skeleton is then measured with a metric scale and map measure, and the percentages divided out with the aid of a slide rule.

IOTA, Cobb, 1914.

Fig. 1, Plate II.

				57		
	14.	21.	25.	-85	92.	
1. <i>Iota octangulare</i> , n.sp.	11.	12.	12.	9.	6.	.4 mm.

Along the longitudinal fields the striæ are so modified as to give the worm somewhat the appearance of being covered by eight rows of relatively large scales arranged in pairs. Six small, simple, flattish lips surround the vestibule. The lips are supplied with six small, innervated papillae. These lie in the midst of a plate-shaped disk, the first annule. There are no recognized traces of amphids, but the recessive nature of the second annule is suggestive, and it is possible that this peculiarity of the second annule is in some way connected with the amphids. There are no eye-spots. The narrow vestibule leads to the equally narrow pharynx, which consists essentially of a muscular tube closely surrounding the spear. This latter is of relatively very large size, and strictly Tylenchoid in structure. Its length is about equivalent to the first twelve annules of the cuticle. It is divisible into two parts: a long cylindrical hollow shaft tapering to a point near its apex, and having a length about equivalent to the first nine annules; behind this shaft a basal portion or "hilt," which in its distal part has a structure like that of the shaft, but with a slightly greater diameter. This hilt terminates in a threefold, flattish bulb about one-fourth as wide as the corresponding portion of the neck. The lumen of the spear is continuous with that of the oesophagus. This latter consists mainly of a narrow, chitinous tube, which is usually somewhat coiled when the spear is at rest. That portion of the oesophagus containing the hilt of the spear and the coiled oesophageal tube just mentioned constitutes a somewhat obscure elongated "bulb." This bulb, however, is not the morphological equivalent of the bulb usually seen in the oesophagus of *Tylenchus* and *Aphelenchus*, as it has no radial muscles, and contains no valvular apparatus. The remaining short portion of the oesophagus is tubular and narrow, though it swells slightly at the terminus, where it is about one-eighth to one-ninth as wide as the base of the neck. The excretory pore empties through the exterior margin of the nineteenth annule, or thereabouts. It may be distinctly seen when the worm is viewed from the ventral side, and less distinctly seen in profile.

Habitat: Dismal Swamp, Va. Flemming solution to glycerine.

RHABDOLAIMUS, de Man, 1880.

Fig. 2, Plate II.

						28	
2. <i>Rhabdolaimus minor</i> , n.sp.	4.6	15.	25.	'51'	77.5		.28 mm.
	2.4	3.7	3.8	4.	2.		

The thin layers of the transparent, naked, colorless cuticle appear to be destitute of any but very fine transverse striations, most clearly visible near the head. The conoid neck ends in a rounded head which is not set off in any way. There are no cephalic setae. Careful focussing appears to indicate on the outer margin of the head the presence of almost invisible papilla-like organs which may perhaps be representatives of cephalic setae. There are no lips. The amphids are located at a distance from the anterior extremity about three times as great as the width of the lip-region, and a little more than twice as great as the width of the head near where they occur. Seen in dorso-ventral view they have the appearance of obscure openings from which there leads inward and backward slight refractive elements which soon become indefinite. Immediately behind the mouth opening there is at least one obscure refractive element of small size, apparently very much as figured by Dr. de Man in his description of the type species. The tubular pharynx is long and slender, extending backward for a considerable distance behind the amphids. Its total length is probably a little less than one-third the distance to the nerve-ring, though the limits are not definite in the specimens so far examined. The oesophagus is at first about three-fourths as wide as the head and continues to have this diameter, or a slightly greater diameter, until near the end, where it expands to form the pyriform cardiac bulb which contains an obscure valvular apparatus. This bulb is three-fourths as wide as the base of the neck. The lining of the oesophagus may be faintly seen throughout its length. The rather thin-walled intestine which is separated from the oesophagus by a slight constriction becomes at once three-fourths as wide as the body. It appears to be composed of cells of such size that probably only four to six are required to build a circumference. From the nearly continuous anus, the rectum, which is somewhat longer than the anal body diameter, extends inward and forward. The tail begins to taper from a little in front of the anus and tapers regularly to the terminus which is armed with a striking, elongated, unarmed, slightly tapering, acute spinneret. Where the tail joins the spinneret the diameter is about one-fifth as great as at the anus. There is a sudden and very slight diminution of diameter of the terminus where it joins the spinneret. From the inconspicuous vulva, the vagina leads inward and forward. The symmetrically reflexed ovaries reach about half way back to the vulva. The thin-shelled, smooth eggs are relatively large and elongated and have been seen in the uterus one at a time. They are about four to five times as long as the body is wide and about one-fifth as wide as long. They appear to be deposited before segmentation begins.

Habitat: Mud, Beach pool, Pine Point, Douglas Lake, Michigan. Sublimate to balsam.

DIPLOGASTER, Max Schultz, 1857.

Fig. 3, Plate II.

3. *Diplogaster fector*, Bastian $\frac{1.3 \quad 10.7 \quad 13.8 \quad 35 \quad '51' \quad 88.1}{1.3 \quad 1.4 \quad 1.4 \quad 1.7 \quad 1.4}$ 1.5 mm.

The thin layers of the transparent, colorless, practically naked cuticle are traversed by exceedingly fine transverse striae, resolvable with high powers under favorable conditions, which become considerably coarser toward the head, where they are resolvable into rows of refractive dots arranged in longitudinal, as well as transverse lines. A short distance behind the head the longitudinal rows arrange themselves in pairs. These pairs indicate the locus of about twenty-four cuticular ribs or wings, which extend from the middle of the neck to near the anus. On the tail these ribs again resolve themselves into double rows of dots, and gradually disappear as the tail grows narrower. Very little is to be seen of them behind the middle of the tail. The cylindroid neck ends in a somewhat rounded head, which bears near its outer margin a circlet of six somewhat forward-pointing, tapering cephalic setae, each about one-third as long as the head is wide. There is one of these setae on each submedian line and one on each lateral line. Just in front of the base of each lateral seta a minute obscure pore or papilla was observed, which did not appear to exist in connection with the other setae. The amphids, though only faintly visible, are of relatively large size. Their form is partly indicated by a lateral area on which the punctations of the cuticle are absent. This is a somewhat elliptical area placed transversely on the side of the head, with its long axis at right angles to the lateral line. Its length is equal to half that of the corresponding diameter of the head. Its anterior contour is more definite than the posterior, although it is only by the most careful focusing that the definite line of contour can be distinguished. Through the middle of the area, however, there is quite a distinct arcuate line, with its convex side toward the lips. When seen dorso-ventrally the amphids have the appearance of distinct oblique openings, leading inward and backward. When the mouth is opened and the lips recurved the amphids are moved forward somewhat and the transverse line mentioned becomes more strongly curved and forms a semi-circumference. The circular mouth opening is very finely striated on the inner surface of the lip region. These striae begin on the inner face of the lips near where the cuticular wall of the pharynx first appears. They extend backward nearly to the base of the pharynx and end indefinitely. In front of this finely longitudinally striated area the transverse marginal portion of the lips is more coarsely divided into fourteen parts. The lips are capable of being opened, so that the oral aperture is two-thirds as wide as the head. Under such circumstances it is seen that the lip region is flower-like in form with fourteen recurved segments, the distal tapering portion of each of which is plain and

transparent, while the basal portion is traversed longitudinally by four minute, refractive, somewhat beaded longitudinal striae. The pharynx is about as deep as it is wide, and in its widest part is a little more than half as wide as the front of the head. It is well filled at the base with the two crescent-shaped, pointed, pharyngeal teeth. These extend inward and then forward, their points being close to the body axis. The front contours of the teeth are incurved, and at one point on their front surface they are exceedingly finely striated. Each of these teeth occupies about one-fourth of the width of the head; measured in the longitudinal direction its extreme limits are less than when measured transversely. The entire length of the pharynx is probably somewhat greater than the width of the head, though it joins the lumen of the oesophagus in such an indefinite way that it is sometimes rather difficult to say where the pharynx ceases and the true oesophagus begins. The portion of the oesophagus surrounding the pharynx is, however, distinctly, though slightly, swollen, so that it is proper to speak of an elongated pharyngeal bulb. Just at the base of the pharynx this bulb is two-thirds as wide as the corresponding portion of the head. At a point two or three body diameters farther back it is only about half as wide as the corresponding portion of the neck; thence onward it expands a very little. Near the middle of the neck the oesophagus expands to form the elongated muscular median bulb, which is three-fourths as wide as the middle of the neck. Here the lining is more strongly developed, and occupies about one-fourth of the optical longitudinal section, while the lining of the preceding portion of the oesophagus occupies not more than one-fifth to one-sixth of the diameter. Behind the median bulb the oesophagus is less strongly developed. The lining is much less conspicuous and the radial muscular fibers are less abundant. At first this posterior portion of the oesophagus is only about one-fourth as wide as the middle of the neck. It expands gradually until near the end, then more rapidly so as to form an elongated-clavate swelling, three-fourths as wide as the base of the neck. The lining of this portion of the oesophagus is a distinct feature, but is by no means so strongly developed as that of the preceding portions of the oesophagus. There is a well developed flattish cardia, half as wide as the base of the neck. The intestine, which is separated from the oesophagus by a distinct constriction, becomes at once about three-fourths as wide as the body. Its cells contain scattered, nearly colorless granules of variable size, the largest of which have a diameter nearly equal to the distance between two of the adjacent longitudinal striations. From the slightly depressed anus the rectum, which is about one and one-half times as long as the anal body diameter, extends inward and forward. The tail is conoid from the anus and tapers rather regularly to the extremely fine, hair-like terminus. There are no caudal glands.

From the rather prominently elevated vulva the chitinated vagina leads inward at right angles to the ventral surface half way across the body, where it joins the two symmetrically-placed uteri. The reflexed ovaries reach

about half way back to the vulva and contain six to ten developing ova arranged single file. The thin-shelled eggs, which are deposited before segmentation begins, are fully twice as long as the body is wide and about one-third as wide as long, and occur in the uteri one at a time. Full-grown ova are ellipsoidal, and about one and one-half times as long as the body is wide and about half as wide as long.

55					
.9	12.3	15.5	-M	86.6	
1.1	1.4	1.4	1.5	1.6	1.6 mm.

The tail of the male is like that of his mate in form. There are no supplementary organs in front of the anus. The special male papillae characteristic of this genus are located as follows: A single tapering, ventrally submedian papilla a little in front of the proximal ends of the spicula, and slightly farther back a lateral pre-anal papilla; a ventrally submedian papilla as far behind the anus as that first described is in front of it; a lateral papilla twice as far behind the anus as that just described; a ventrally submedian papilla as far behind that just described as the latter is behind the previous post-anal papilla; between the two ventrally submedian papillae just described a group of minute subventral papillae; near the middle of the tail, on the slender part, two sublateral papillae. Most of these papillae are slender, tapering, and one-third to one-half as long as the anal body diameter. The two equal, yellowish, arcuate, acute spicula are about one and one-fourth times as long as the anal body diameter. They taper pretty regularly from near the proximal ends, where they are one-fourth as wide as the corresponding portion of the body. The proximal ends diminish suddenly in diameter, and are then cephalated by expansion. Each expansion is a rather strongly refractive, more or less bulbous piece of chitin. The accessory piece is arcuate and about one-third as long as the spicula. It is parallel to and applied closely to the spicula. Its framework consists of two distinct, nearly parallel parts. The ejaculatory duct is about one-fourth as wide as the body. The blind end of the single outstretched testicle lies a little farther behind the base of the neck than this latter is behind the anterior extremity.

Habitat: Spring, Washington Country Club, Chevy Chase, Md.
Sublimate to balsam.

PRISMATOLAIMUS, de Man, 1880.

Fig. 4, Plate III.

						14	
4. <i>Prismatolaimus stenurus</i> , n.sp.	1.2	7.4	22.	'39.'	64.	1.1 mm.	
	1.2	1.5	1.9	1.9	1.5		

The moderately thin layers of the transparent, colorless cuticle are traversed by about 550 transverse striae, resolvable with high powers into rows of minute elements. There are no longitudinal striations. Scattered on

the neck and body there are a few hairs arranged at right angles to the surface. These generally have a length equal to the width of two to three annules of the cuticle. The cylindroid neck ends in a somewhat truncated head, which is not set off in any way. On the outer margin of the head at the base of the lips there is a circlet of ten widely spreading, straight, tapering cephalic setae, two of somewhat unequal size on each submedian line, and one on each lateral line. The longest of these setae are a little more than half as long as the head is wide. For two-thirds of their length they are finger-shaped; the remaining third is a much narrower bristle. The very thin lips are arched over the prismoid pharynx, which is nearly as deep as the head is wide, and about three-fifths as wide as the head. It attains its full width immediately behind the lips, and continues to have the same width to the end, so that the bottom of the pharynx, though not even, extends across the base of the head approximately at right angles to the body axis. Where the lumen of the oesophagus joins the pharynx there is, however, a slight backward extension of the pharyngeal cavity. There are no eye-spots. The amphids occur in the form of somewhat elongated transverse markings placed transversely on the neck somewhat farther behind the base of the pharynx than this latter is behind the anterior extremity. Each amphid has a length about one-third as great as the corresponding width of the neck, and is about half as wide as long. Behind each amphid, at a distance equal to the width of two to three annules of the cuticle, there is a short seta. The oesophagus receives the base of the pharynx, and is at once nearly three-fourths as wide as the head. It narrows very slightly in diameter as it passes backward, so that where it passes through the nerve-ring it is about two-thirds as wide as the neck. It continues to have practically the same diameter to near the end, where it is two-thirds as wide as the base of the neck. Immediately in front of the intestine there is a small segment of the oesophagus which is set off by a constriction. This portion is somewhat spheroidal in form. The lining of the oesophagus is a distinct feature throughout its length, and comes into view in the optical section as a single refractive line. This line is nowhere materially altered. There is no distinct cardia, unless the above mentioned spheroidal segment of the oesophagus may be so considered. The rather thick walled intestine, which is set off from the oesophagus by a distinct constriction, becomes at once about two-thirds as wide as the body, and is composed of cells of such a size that probably about four are required to build a circumference. These cells contain numerous granules of rather uniform size, which are not disposed so as to give rise to a tessellation. From the somewhat continuous anus the rectum, which is about as long as the anal body diameter, extends inward and forward. The tail end begins to taper from some distance in front of the anus, and tapers regularly thereafter throughout the anterior portion of the tail. The posterior portion tapers very slightly, and has a diameter one to two times as great as the width of one of the annules of the cuticle, measured near the anus. Though the terminus has considerable

width there is no spinneret. The lateral fields are about one-third as wide as the body. The nerve-ring surrounds the oesophagus somewhat squarely. On the dorsal side, a little behind the cardiac constriction there is a body which presses the intestine a little to one side, which may perhaps be the renette cell. This body has a length as great as the corresponding body diameter, and is about one-fourth to one-third as wide as long. The vulva is somewhat elevated, and from it the vagina extends inward at right angles to the ventral surface about one-third the distance across the body. There are two symmetrically disposed, reflexed ovaries, the blind ends of which lie near the vulva, the position depending to a considerable extent upon the development of the much elongated eggs. The ovaries are moved backward and forward to a certain extent in accordance with the stage of development of the eggs. The eggs, which have been seen in the uteri one at a time, are much elongated—four or five times as long as the body is wide—and about one-fifth as wide as long. They appear to be deposited before segmentation begins.

Habitat: Roadside pool, Douglas Lake, Michigan. Sublimate to balsam.

SPILOPHORA, Bastian, 1865.

Fig. 5, Plate III.

5. *Spilophora canadensis*, n.sp.

The thin, transparent layers of the colorless, practically naked cuticle are traversed by 750 transverse striae, resolvable with high powers into rows of dots, which at the lateral wings are so modified as to give rise to two distinct longitudinal rows of dots of larger size. Along the middle of the body one of these rows is more pronounced than the other. Opposite the base of the neck the distance between these two longitudinal rows is about four times as great as the distance between two of the dot-like elements. There are no eye-spots, nor have any distinct traces of amphids been seen. If the latter are present they must be very inconspicuous. The lips are so small that it is very difficult to count them, but there appear to be twelve, each one obscurely conical. There are no very marked subdivisions between these lips, so that the shallow cyathiform anterior portion of the pharynx, (a, Fig. 5) which is about half as wide as the head and about one-third to one-half as deep as wide, is not prominently striated radially as is sometimes the case in this and related genera. From the slightly depressed vulva, the vagina leads inward at right angles to the ventral surface about half way across the body, where it joins the two symmetrically-placed uteri. The reflexed ovaries reach fully half way back to the vulva, at least in young specimens such as have been examined, and contain a dozen to twenty developing ova arranged in more or less double file. The eggs appear to be elongated, somewhat longer than the body is wide and about one-third as wide as long. It is possible, however, that there is some error here as the description is

derived from a single specimen in which these features are rather obscure. The reversal in the striations of the cuticle is plainly to be seen in the region of the vulva, and its location is indicated by a slight rise in the contour. This slight elevation extends also to the subcuticle.

$$\begin{array}{ccccccc} & & & 60 & & & \\ .5 & 8.3 & 14.8 & -M & 88.4 & & \\ \hline 2. & 4.3 & 4.7 & 5. & 3.2 & & .7 \text{ mm.} \end{array}$$

The wing markings on the anterior part of the tail are pronounced, but on the posterior part much less so. A little in front of the anus they are as pronounced as they are at the base of the neck, and both are equally visible, and the structure not infrequently resembles that of a ladder with the rungs placed close together, just as it does on the neck. The lateral fields appear to be about one-third as wide as the body. Near the middle of the body may plainly be seen the location where the cuticle reverses its structure. Although the striations are minute they present the same character as in species where the striations are coarse, and, upon careful examination, can be seen to be retrorse in opposite directions on the two halves of the body.

Habitat: Fresh water ponds, Cape Breton Island, Dominion of Canada.

MICROLAIMUS, de Man, 1880.

Fig. 6, Plate III.

$$\begin{array}{ccccccc} & & & 27 & & & \\ 6. \text{ Microlaimus fluviatilis, n.sp.} & 1.6 & 8.5 & 15.5 & '44' & 85. & \\ \hline & 1.9 & 3.5 & 4.3 & 4.7 & 2.6 & .83 \text{ mm.} \end{array}$$

The thin layers of the transparent, colorless, naked cuticle are traversed by exceedingly fine transverse striae, which are resolvable with great difficulty into rows of dots, and are not modified on the lateral fields. The conoid neck ends in a rounded head set off by an almost imperceptible constriction. On the outer margin of the head there is a circlet of four submedian, slightly tapering cephalic setae, each about one-third as long as the head is wide. The vestibule is considerably shorter than any of the cephalic setae, and is longitudinally striated, indicating, no doubt, that the lips can be opened outward in receiving food. These longitudinal striations of the vestibule are too minute to be counted, but there are apparently about twelve. The circular amphids are about one-fourth as wide as the corresponding portion of the head, and are located at a distance from the anterior extremity equal to one and one-half times the diameter of the front of the head. There are no eye-spots. The limits of the pharynx are indicated by a slight constriction in the oesophagus. The base of the pharynx is somewhat more than halfway back to the amphids. The general form of the pharynx is cylindroid or prismoid. It is armed with minute and very inconspicuous, somewhat inward pointing and apparently not very regular teeth or projections. The most conspicuous of these projections are two just behind the base of the lips, one dorsal and the other apparently ventral, and

a third at the base of the pharynx on the dorsal side. The oesophagus begins as a tube about half as wide as the corresponding portion of the neck, and continues to have this diameter until it swells to form the pyriform cardiac bulb, which is about three-fourths as wide as the base of the neck, and contains a distinct chitinized threefold, rather simple, valvular apparatus, occupying two-fifths of the diameter as seen in longitudinal section. The musculature of the bulb is divided into three sections, a small anterior section, a middle and a posterior section. Of these two latter the posterior is slightly the smaller. The lining of the oesophagus is a fairly distinct feature throughout its length. There is no very distinct cardia. The intestine joins the middle of the posterior surface of the cardiac bulb, and is there one-fourth as wide as the base of the neck. It soon expands so as to become about two-thirds as wide as the body. It is rather thick walled, and is composed of rather thick cells which are of such a size that about four are required to build a circumference. These cells contain minute granules. From the anus the rectum, which is considerably longer than the anal body diameter, extends inward and forward. The tail is conoid, and tapers from the anus toward the terminus, which is conoid and has a diameter one-third as great as that of the base of the tail, and bears a blunt convex-conoid unarmed spinneret. The rather small caudal glands appear to be located in the anterior third of the tail. The lateral fields have not been seen. From the inconspicuous vulva the vagina leads inward at right angles to the ventral surface to the single or double uterus, which when single extends forward. There sometimes appears to be a small posterior rudimentary branch to the sexual organs, which is about equal in length to the corresponding body diameter. The reflexed ovary reaches about halfway back to the vulva, and contains about half a dozen or more ova arranged somewhat irregularly. The eggs appear in the uterus one at a time. They are smooth, somewhat thin-shelled, and are about twice as long as the body is wide, and about one-third as wide as long. They appear to be deposited before segmentation begins. Specimens with one ovary, and those with two, appear to be about equally numerous; as no other difference has been detected, they are included for the present under the same name and description. The renette cell is an elongated cell located a short distance behind the base of the neck. It is fully as long as the body is wide, and about one-fourth as wide as the body. The excretory pore appears to be located opposite the nerve-ring. The nerve-ring surrounds the oesophagus somewhat squarely.

Habitat: Maple River, Michigan. Sublimate to balsam.

TRIPYLA, Bastian, 1865.

Fig. 7, Plate III.

				49	
7. <i>Tripyla lata</i> , n.sp.	1.1	6.8	19.6	'54'	83.5
	2.3	3.1	3.5	4.	3.2
					2.4 mm.

The thick layers of the transparent, colorless, naked cuticle are apparently traversed by about 250 transverse striae, which are not further re-

solvable. In the lumen of the pharynx at a point removed from the anterior extremity a distance a little greater than the radius of the head, there is a minute inward-pointing dorsal tooth, having a length about equal to the width of one of the annules of the cuticle. This and other matters prove that the pharynx, although not readily distinguished, extends backward a distance about equal to the width of the head. In some specimens it is possible to see a distinct transverse fold in the lining of the oesophageal tube. This is located at a distance from the anterior extremity about equal to the corresponding diameter of the head, and undoubtedly indicates the posterior limits of the pharynx. It is possible that the tooth just mentioned may be connected with internal glandular structures in the oesophagus, as the interior of the dorsal segment of the oesophagus at this point is usually more or less different in structure from the other portions and does not seem to be made up entirely of muscular fibers. The oesophagus is separated from the intestine by a flattish, pseudo-bulb. The bulb is separated from the oesophagus on one side and the intestine on the other by deep and distinct constrictions. In the anterior constriction there are at least two granular, elongated cells of considerable size. The nerve-ring surrounds the oesophagus rather squarely. Nothing definite is known concerning the renette or the excretory pore. From the inconspicuous vulva, the vagina leads inward at right angles to the ventral surface fully half way across the body, where it joins the two symmetrically-placed uteri. The reflexed ovaries reach about half way back to the vulva, and contain a dozen to twenty developing ova arranged somewhat irregularly. Both in front of and behind the vulva there are unicellular glands, having a diameter about one-sixth as great as that of the body.

				50	
.7	6.8	19.3	-M-	82.8	
2.1	3.2	3.9	4.8	4.1	2.4 mm.

The tail of the male is like that of the female except that the anus is slightly raised. In front of the anus there is a ventral row of about twenty innervated supplementary organs, reaching to near the head. The distance between two consecutive organs is about equal to the radius of the body. Each of these appears to consist of a nerve-ending which penetrates the cuticle and forms a papilla, around which there is an almost imperceptible elevation having a width about equal to two of the annules of the cuticle. The visibility of this small organ is quite as much due to the alteration in the body wall and subcuticle as to that in the cuticle. There are no supplementary setae or papillae either in front of the anus or behind it. The two equal, slightly arcuate, uniformly tapering, acute spicula are about one and one-fourth times as long as the anal body diameter. Their proximal ends are not cephalated, though the wall of the cuticle is very slightly thickened at that point. The spicula taper regularly from the proximal ends to the rather

truncated points. There are obscure accessory pieces lying close to the surface of the spicula and forming a double groove in which these latter slide. The ejaculatory duct, though narrow at first, soon becomes nearly half as wide as the body. There are two slender, outstretched testicles extending in opposite directions from near the middle of the body. The anterior one has its blind end about as far behind the base of the neck as the nerve-ring is in front of it.

Habitat: Alpine lakes, Bald Mountain, Colorado. Formalin to glycerine.

TERATOCEPHALUS, de Man, 1876.

Fig. 8, Plate IV.

8. *Teratocephalus cornutus*, n.sp. $\frac{.7 \text{ II. } 22. \text{ '50.' } 84.}{1.1 \text{ 1.6 } 1.8 \text{ 1.9 } 1.1} .8 \text{ mm.}$

The thin, transparent layers of the colorless naked cuticle are traversed by about 1500 transverse striae, resolvable into rows of minute dots, which are modified on the lateral fields. These modifications have been seen in all parts of the body, and near the tail consist of two to three irregular longitudinal rows of enlarged dots. The posterior portion of the neck tapers but little. The anterior portion becomes convex-conoid toward the head, which bears a lip region more or less set off by a constriction opposite the base of the spreading cephalic setae, which are four in number and submedian in position. Each seta is a little more than half as long as the head. These are connected with a refractive six-ribbed chitinous dome-like framework, which extends back to opposite the middle of the pharynx. The ribs start at the lip region, extend backward, and then join each other opposite the base of the vestibule. The chitinous refractive elements at this latter region form a rather distinctly crenate contour around the head. No other setae than the cephalic setae have been seen in any part of the body. The lips appear to be rather thin, and are arched together over the unarmed pharynx, which is somewhat elongated and about half as wide as the base of the head. While it is somewhat irregular in form it is approximately prismoidal or cylindroid and nearly as deep as the head is wide. Its walls are not very strongly chitinized, but more strongly so anteriorly than posteriorly. The oesophagus receives the base of the pharynx, and soon becomes half as wide as the base of the head. In the anterior portion of the oesophagus, a short distance behind the pharynx are three slightly arcuate, refractive elements, corresponding somewhat in curvature with the contour of the front end of the oesophagus. These resemble to a certain extent the refractive elements in the posterior chamber of the pharynx of *Plectus*. In the present species they are about as long as the pharynx, and are separated a distance about equal to one body width. They are a little wider and more plainly visible anteriorly than posteriorly. The obscure amphids, as

far behind the base of the pharynx as this latter is behind the anterior extremity, are one third as wide as the corresponding part of the head. and consist of obscure spirals of one wind. There are no eye-spots. The oesophagus begins as a tube about half as wide as the corresponding portion of the head, but expands very slightly as it passes backward, so that at the middle it is about two-thirds as wide as the middle of the neck. Behind this point it diminishes. There is a break in the musculature somewhat similar to that occurring in *Cephalobus*. At the break, which occurs at the beginning of the fourth fifth, the oesophagus is somewhat narrow, about half as wide as the corresponding portion of the neck. It finally expands to form the ellipsoidal cardiac bulb, which has a relatively large, chitinous, striated, complicated, three-fold valvular apparatus half as wide as itself. There is a truncate-conoid cardia about one-third as wide as the base of the neck. The lining of the oesophagus is a fairly distinct feature. The thick-walled intestine, which is separated from the oesophagus by a constriction, soon becomes two-thirds as wide as the body. It is composed of cells of such a size that four are required to build a circumference. The walls of these cells are refractive, so that the cells are readily distinguished from each other, though there is no distinct tessellation. These cells contain minute very uniform granules. The lining of the intestine is refractive, so that the lumen is distinctly to be seen. From the rather inconspicuous anus the rectum, which is about as long as the anal body diameter, extends inward and forward. The internal sexual organs are double and symmetrically reflexed. The tail is conoid from the anus to the subacute terminus. This species is related to those described by Dr. de Man under the name of *Teratocephalus*. It is doubtful whether these forms will not have to be subdivided at some future time, after the accumulation of the necessary data.

Habitat: Maple River, Michigan. Sublimate to balsam.

ALAIMUS, de Man, 1880.

Fig. 9, Plate IV.

				41		
9. <i>Alaimus simplex</i> , n.sp.	.2	11.	19.	35'	92.	2. mm.
	.3	.8	.9	1.1	.6	

The thin, transparent layers of the colorless, naked cuticle would ordinarily be described as destitute of striations. Very minute striations may be observed in the subcuticle at the extremities, when the specimens are examined under favorable conditions with the highest powers. There are obscure traces of lateral wings. The conoid neck ends in a rounded head not set off in any way. There are no distinct lips, and only the faintest possible indications of labial papillae. These are so obscure that it has been found impossible to enumerate them. There is no pharynx and the mouth opening is exceedingly minute. No amphids or eye-spots have been seen.

The oesophagus begins at the lip region as a tube two-thirds as wide as the head, and expands gradually and rather regularly to the end, where it has a diameter three-fourths as great as that of the neck. A short distance behind the head end, a distance six times as great as the diameter of the head, there is a slight alteration in the structure of the oesophagus the significance of which remains doubtful. The lining of the oesophagus is not a very distinct feature. There is a very obscure, small cardia. The intestine, which is separated from the oesophagus by a constriction, becomes at once about two-thirds to three-fourths as wide as the body. At first its cells contain but few scattered granules, but soon they are characterized by the presence in them of loosely scattered yellowish-brown granules of variable size, the largest of which have a diameter nearly one-eighth as great as that of the body itself, and the smallest of which are very much smaller. These are not arranged so as to give rise to any distinct tessellation. Toward the end of the intestine the granules again become less abundant and smaller, so that for some distance in front of the rectum there is only here and there a granule. From the depressed and conspicuous anus the chitinized rectum, which is a little longer than the anal body diameter, extends inward and forward. There is no distinct pre-rectum. The tail end begins to taper from a long distance in front of the anus, but tapers very gradually to behind the anus. Thence onward it is inclined to be arcuate and tapers regularly to near the terminus. Near the end it tapers more rapidly than elsewhere, and finally comes to an almost acute point at the terminus. A short distance in front of the terminus, however, the diameter is about half as great as it is at the anus. There does not appear to be any spinneret, and therefore, of course, caudal glands are absent. The lateral fields appear to be about one-third as wide as the body. Nothing is known concerning the excretory pore. From the slightly elevated vulva the vagina leads inward nearly at right angles to the surface more than halfway across the body, where it joins the single uterus, which extends backward. The ovary is reflexed, and the blind end is about halfway back to the vulva. The eggs occur in the uterus one or two at a time, and are very much elongated. They are about six times as long as the body is wide, and about one-eighth as wide as long, and are covered by a distinct, smooth shell. They are apparently deposited before segmentation begins. The spermatozoa appear to be elongated-ellipsoidal, and a little more pointed at one end than at the other. They have a length one-fifth that of the body diameter.

68

.2	7.4	15.	M	94.	
.3	.6	.7	.9	.7	2.3 mm.

The tail of the male is like that of the female in form and size, but the anus is somewhat elevated. In front of the anus there appears to be a ventral row of very obscure, broad, flattish supplementary organs. Perhaps these ought to be described as locations of nerve endings rather than as distinct organs. Their number remains doubtful, but there are about

three or four occupying a distance equal to half the length of the tail. The two equal, straight spicula are rather obscure. Their length is no greater than the length of the anal body diameter. Oblique copulatory muscles are seen in the vicinity of the spicula, and there is a refractive element passing backward from the accessory piece toward the ventral side of the tail near the anus, which may be muscular, or possibly chitinous and serving for the attachment of muscles. The ejaculatory duct is about one-third as wide as the body, the vas deferens somewhat wider. Whether there are two testes or only one has not been determined. There is a broad, rounded, blunt end of a testis located as far behind the base of the neck as this latter is behind the anterior extremity.

Habitat: Big Lake, Fla. Bouin solution to glycerine.

PLECTUS, Bastian, 1865.

Fig. 10, Plate IV.

10. <i>Plectus tubifer</i> , n.sp.	2.	10.7	19.	³⁵ '49'	92.6	.74 mm.
	2.1	3.4	3.5	3.2	2.3	

The skin is of medium thickness, colorless, and traversed transversely by fine, plain striae. The striae are of such a size that about twenty of them occupy a space equivalent to the body diameter. There are no hairs on the surface of the body, but throughout the length of the body, more particularly on the submedian lines, may be seen very faint markings in the cuticle, which indicate the location of four rows of pores connecting with interior organs. Immediately behind the lateral organs one sees the first of the series of pores located in the lateral line. This first pore, though much smaller than the lateral organs, is yet somewhat larger than the succeeding ones, which gradually spread out to form two submedian rows. The total number of these pores on one side (of the male) is about one hundred; that is, there are about two hundred in all. The six low, rounded lips are rather massive, and are arched together over the pharynx. These lips appear to be armed with chitinous processes on the inner surface, these processes surrounding a short napiform vestibule leading to the pharynx proper. If any labial papillae are present they are exceedingly minute; what appear to be traces of papillae may occasionally be seen. The lateral organs are well forward, being located only slightly behind the cephalic setae. They present transversely elongated contour markings open on the posterior margin. The lateral fields appear to attain a considerable width and two chitinous, lateral markings close together with a third between them, appear to indicate the existence of a wing on each side of the body.

$$\begin{array}{ccccccc} & & & 54 & & & \\ 1.9 & 10.1 & 19.2 & 'M & 91.5 & & \\ \hline 2. & 3.1 & 3.4 & 3.6 & 3.3 & & \end{array} .79 \text{ mm.}$$

$$\begin{array}{ccccccc} \text{One male whose formula was} & 2.4 & 10. & 19.5 & 'M & 93. & \\ \hline & 1.6 & 2.8 & 3.2 & 3.3 & 2.8 & \end{array} .9 \text{ mm.}$$

possessed four supplementary organs, the additional one being some little distance in front of the others, which were arranged as illustrated. Sometimes there are only two of these organs, one smaller than the other. The cuticle of the ventral surface is slightly thickened and elevated where it is pierced by these tubular organs, which appear in some instances to be slightly exerted. Apart from these preanal supplementary organs, there are ventrally submedian papillae on the tail;—one pair near the middle, another pair half way between these and the anus, and a third pair part way from that first mentioned to the terminus. There is a fourth pair indistinctly to be seen just behind the anus; these are closer together than the members of the other pairs. Furthermore there are one or two very small pairs near the terminus, but perhaps these may partake more of the nature of hairs than of papillae. Just in front of the anus there is a single ventral almost setose papilla. There occur in front of the anus at least two pairs of ventrally submedian papillae. These are located one just in front of the posterior supplementary organ and the other just behind it. Most of these features are not easy to decipher, very careful observation being necessary to enumerate the papillae as above. There are two testicles, one anterior to the other, the anterior being outstretched and extending forward, the posterior being reflexed near its middle, so that its blind end lies somewhere near the junction of the two. The anterior one of this pair is connected with the seminal vesicle by a tubular portion, which lies alongside the reflexed posterior member.

Habitat: Arlington, Va. Flemming solution to glycerine.

DORYLAIMUS, Dujardin, 1845.

Fig. 12, Plate V.

$$\begin{array}{ccccccc} & & & 43 & & & \\ 11. \text{ Dorylaimus fecundus, n.sp.} & 2. & 4.4 & 16. & '43' & 96. & \\ \hline & .5 & 1.1 & 1.6 & 1.9 & 1.2 & \end{array} 3.4 \text{ mm.}$$

The thin layers of the transparent, colorless, naked cuticle are traversed by exceedingly fine, plain, transverse striations resolvable with the highest powers of the microscope under favorable conditions. Longitudinal striations are visible throughout the length of the body. The presence of amphids is indicated by a transverse marking immediately behind the lip region, and somewhat in front of the guiding ring of the spear. The anterior contour of each organ is a transverse line about three-fifths as long as the corresponding portion of the head is wide. Extending backward from this are lateral contours which approach each other slightly and end indefinitely. The

oesophagus begins as a tube about half as wide as the corresponding portion of the neck, and continues to have this diameter until near the middle of the neck, where it first begins to expand. A little behind the middle of the neck it expands rather suddenly, so that the remainder of the organ is about two-thirds as wide as the base of the neck. There is a much elongated conoid cardia nearly as long as the body is wide. The intestine, which becomes at once three-fourths as wide as the body, is separated from the oesophagus by a distinct though slight constriction. The cells forming the intestine are of such a size that about four or five are required to build a circumference. They contain granules of variable size, the larger of which have a diameter equal to the thickness of the outer transparent cuticle, and the smaller a diameter only about one-fourth as great as that of the larger. These granules are so arranged as to give rise to a very obscure tessellation. The pre-rectum is about three to four times as long as the corresponding body diameter, and is separated from the intestine by a difference in structure, the granules contained in its cells being smaller, and not darkening under the influence of osmic acid, as do those of the intestine. Nothing is known concerning the salivary glands or the renette. The longitudinal fields are well developed, being about half as wide as the body. The nerve-ring surrounds the oesophagus somewhat obliquely. Each of the two elongated uteri may contain three to five eggs at a time. These, as they appear in the uteri, are elongated, finely granular, rather thin-shelled, and about one and one-half times as long as the body is wide, and about half as wide as long. The shells are flexible, so that owing to the pressure of one egg on another in the uterus the surfaces are often indented.

$$\begin{array}{ccccccc} .3 & 4.8 & 17. & -M- & 99. & & \\ \hline .6 & 1.2 & 1.4 & 1.4 & 1.4 & & 3.5 \text{ mm.} \end{array}$$

In addition to the ventral row of supplementary male organs shown in the illustration, there are two rows of ventrally submedian, innervated papillae, arranged in a somewhat equidistant manner. Where these reach the surface of the body they give rise to almost imperceptible elevations which, however, are of a different character from those at the ends of the ventral organ shown in p, Fig. 12. In other words, these papillae are more nearly the homologues of the ordinary tactile hairs or papillae so common on the surface of nematode worms. These submedian papillae are located at a distance from each other equal to about two-thirds the body diameter. They are very nearly coextensive with the oblique copulatory muscles.

Habitat: Algae, Potomac River, Washington, D. C., 1911. Flemming solution to glycerine.

IRONUS, Bastian, 1865.

Fig. 13, Plate V.

12. <i>Ironus americanus</i> , n.sp.	3.7	9.2	21.3	³⁰ '52'	92.5	2.3 mm.
	1.6	2.3	2.7	2.9	1.3	

The moderately thin layers of the transparent, colorless, naked cuticle appear to be destitute of striations. There are three somewhat conoid lips, which when open, give to the head a somewhat truncated appearance, when folded a somewhat rounded appearance. Each lip bears internally a slightly arcuate, conical tooth, whose altitude is somewhat greater than the width of its base. When the mouth is so opened that the apices of these refractive teeth are about on a level with the anterior extremity their bases lie a little in front of the bases of the cephalic setae. The apices of these teeth are slightly blunt and they have a slight outward curvature. The walls of the pharynx are strongly refractive, and have about the same thickness as the walls of the cuticle. The chitin of the walls of the pharynx, however, is more refractive than that of the cuticle. In this respect it resembles the chitin of which the teeth are composed. Except for the teeth at the mouth opening the pharynx is unarmed, but presents on the dorsal side about half way between the head and its posterior extremity three or four exceedingly minute projections with corresponding depressions. The oesophagus begins near the base of the pharynx, at least it is at this point that the radial structure becomes pronounced. At first it is about two-thirds as wide as the corresponding portion of the neck. It enlarges a little and very gradually, so that finally it is about half as wide as the base of the neck. The lining of the oesophagus is an exceedingly distinct feature throughout its length. It generally has the appearance of three refractive lines occupying a space nearly one-fourth as wide as the oesophagus itself. There is a large cylindroid or hemispherical cardia, one-third as wide as the base of the neck. The intestine, which is separated from the oesophagus by a deep, narrow and distinct constriction, becomes at once about three-fifths as wide as the body. Its cells contain scattered granules of variable size, the largest of which have a diameter nearly equal to the width of the refractive portion of the lining of the oesophagus, and the smallest of which have a diameter not more than one-tenth as great. The body wall is thick, generally occupying about three-fifths of the diameter of the body. The lateral fields are a little more than one-third as wide as the body. Nothing is known concerning the renette or the excretory pore. There is no spinneret. The tail, nevertheless, contains small cells near the anus which bear a certain resemblance to the ordinary caudal glands. From the slightly elevated vulva, the vagina leads inward at right angles to the ventral surface half way across the body where it joins the two symmetrically-placed uteri. The reflexed ovaries reach three-fourths the distance back to the vulva, at least in specimens which do not contain eggs. The ovaries contain about a dozen ova arranged for the

most part single file. Nothing very definite is known concerning the form and size of the eggs, but from the size of the apparently matured ova it is assumed that the eggs are considerably elongated, perhaps two to two and one-half times as long as the body is wide, and if so, it is unlikely that more than one is contained in the uterus at a time.

Habitat: Deer Bottom, Pikes Peak region, Colorado. Formalin to glycerine.

ONCHOLAIMUS, Dujardin, 1845.

Fig. 14, Plate V.

13. *Oncholaimus punctatus*, n.sp.

The rather thin, transparent, colorless layers of the naked cuticle appear to be destitute of striations. It is rather difficult to observe the cuticle on account of the presence in it of *numerous dot-like elements*, which near the head are arranged in *longitudinal groups*, of which the widest is the lateral group. The longitudinal arrangement of the granules, is continuous throughout the body, but it is most marked on the lateral fields where there is a definite band of them, having a width about two-fifths as great as the width of the body. Each margin of this band is made up of a distinct, longitudinal row of granules arranged single file. The neck is slightly conoid, becoming slightly convex-conoid toward the rounded head, which is not set off in any way, or at most by an exceedingly obscure, broad constriction opposite the pharynx. The six lips are distinct and well developed and have a distinct, somewhat chitinous framework. They are arched together over the pharynx in such a way as to produce a dome-like effect, the very thin and movable flaps at the ends of the lips meeting together at the middle of the front of the head. Opposite the middle of the amphids there is a transverse marking or line which extends around the middle of the head. It is characterized by staining somewhat more strongly with carmine than the other portions of the cuticle. There are no eye-spots. The oesophagus begins at the base of the pharynx with a diameter three-fourths as great as that of the base of the head, and it continues to have this diameter until some distance behind the nerve-ring. It then begins to expand gradually, so that finally it is about three-fourths to four-fifths as wide as the base of the neck. The lining is a distinct feature throughout the length of the oesophagus. There is a distinct conoid cardia, whose base is about half as wide as the corresponding portion of the body. The intestine, which is separated from the oesophagus by a deep and distinct constriction, appears to have rather thin walls and to be composed of cells of such a size that probably six or more would be required to build a circumference. These cells contain numerous granules of rather uniform size.

The lateral fields are about two-fifths as wide as the body. The location of the ventral gland has not been made out. The excretory pore is lo-

cated just *behind the base of the pharynx*. The duct which leads to it seems to be destitute of an ampulla.

$$\begin{array}{cccccc} & & 40 & & & \\ 1.9 & 10.2 & 21.4 & -M- & 92. & \\ \hline 1.2 & 2.2 & 2.8 & 2.5 & 1.8 & 2.1 \text{ mm.} \end{array}$$

In front of the anus there is a series of about *fifty* pairs of oblique copulatory muscles, whose presence is indicated by the oblique groups of granules in the cuticle. The ejaculatory duct is about one-third as wide as the body. The blind end of the anterior testicle is about twice as far behind the base of the neck as this latter is behind the anterior extremity.

Habitat: Fresh water ponds, Cape Breton Island, Dominion of Canada. Sublimate to balsam.

DOLICHODORUS, n.g.

Fig. 16, Plate VI.

58

14. *Dolichodorus heterocephalus*, n.sp. $\begin{array}{cccccc} .3 & (3.4) & 7.1 & 9.1 & -52- & 97.2 \\ .6 & (1.1) & 1.6 & 1.7 & 2.1 & 1.2 \end{array} 3. \text{ mm.}$

The thin layers of the transparent, naked, colorless cuticle are traversed by transverse striae resolvable with high powers under favorable conditions into rows of exceedingly minute, somewhat irregular elements. This resolution is not at all difficult in specimens which are moulting. Under these conditions scales of the outer cuticle sometimes survive, readily resolvable into refractive transverse markings between which are the small elements mentioned. Ordinarily at first glance, the cuticle appears to be merely resolvable into transverse striae which are somewhat roughened on the edges of the dividing lines. The conoid neck ends in a head which has a very prominent lip-region set off by a very prominent and deep constriction. The front of the head is rounded, and the constriction separating the lip-region from the remainder of the head is of such a nature that the contour of the lip-region, when seen in optical longitudinal section is somewhat elliptical, so that the lip-region has the form of an ellipsoid of rotation. The depth of this figure is about equal to half its width. No papillae have been seen on the lips, but minute papillae might readily be present without having been observed. No traces of amphids have been seen. There are no eye-spots. The vestibule is exceedingly narrow and closely surrounds the apex of the very slender narrow spear. This latter extends nearly half-way to the anterior border of the median bulb and is long and slender like that of *Trichodorus*. The oesophagus at the base of the spear is a tube about one-third as wide as the corresponding portion of the neck, and continues to have this diameter until it expands suddenly to form the elongated median bulb, which is three-fourths as wide as the corresponding portion of the neck and fully twice as long as wide and is armed internally with a conspicuous, ellipsoidal, rather simple valvular apparatus nearly half as wide as itself. When

seen in optical longitudinal section the bulb is a little wider posteriorly than anteriorly, so that its sides are not parallel, but approach each other a trifle as they pass forward. The bulb ends more abruptly posteriorly than anteriorly, and is continued by a narrow section of the oesophagus only one-eighth as wide as the corresponding portion of the neck and about as long as the corresponding portion of the neck is wide. This is succeeded by a broadly clavate swelling which does not have any distinct chitinous lining, and is of granular structure, rather than muscular. This swelling is about two-thirds as wide as the base of the neck. The lining of the oesophagus is a fairly distinct feature in all parts in front of the posterior swelling. The intestine joins the middle of the rounded surface of the posterior oesophageal swelling and is at this point only one-tenth to one-eighth as wide as the corresponding portion of the body, but soon expands to be two-fifths as wide as the body. It is, therefore, relatively narrow. On the other hand, the body walls are correspondingly thick. Nothing is known concerning the renette cell. It is probable that there is an excretory pore located near the nerve-ring.

60					
.3	(2.3)	7.9	10.9	-M	99.3
<hr/>					2.4 mm.
.4	(.8)	1.2	1.4	1.7	1.8

The tail of the male is conoid and extends beyond the anus a distance hardly as great as the length of the anal body diameter. It seems likely that the tail is also flattish. When seen dorso-ventrally it appears to be about one-half as long as the spicula, and ends in a dentate terminus one-third as wide as the base of the tail. The cuticle of the tail is very thick, and at first sight seems rather closely to resemble the structure of the two bursal flaps. The distinctly two-parted bursa springs from opposite the middle of the spicula and extends backward and is completely furcated at a point about opposite the base of the tail. The flaps extend backward beyond the terminus of the tail and give to the posterior extremity somewhat the appearance of ending in three thin transparent, colorless flaps, one of which is soon seen to be the true caudal extension. The flaps of the bursa are striated in much the same manner as the cuticle, and the margins of the flaps are distinctly thickened. No distinct ribs have been seen in the two broad backward pointing flaps of the bursa. The two equal, rather strongly built, tapering spicula have a length about one and one-half times as great as that of the diameter measured opposite their proximal ends. They are accompanied by a rather simple accessory piece one-half as long as themselves, judging from its appearance when seen dorso-ventrally. The proximal ends of the spicula can hardly be said to be cephalated, but they are obliquely truncated and wider than elsewhere. When seen dorso-ventrally this width appears to be one-fourth as great as that of the corresponding portion of the body. No special setae are present and no special papillae have been seen. The single outstretched testicle extends forward and has its blind end located about three to four times as far behind the base of the neck

as this latter is behind the anterior extremity. Near its blind end its diameter is about one-half as great as that of the body. The spermatozoa are small and numerous and it appears that the reduction divisions take place in a short segment of the testis not far from the blind end.

Habitat: Freshwater, "Douglas Lake," Michigan. Silver Spring, Florida. Female, Flemming solution to glycerine; from Florida. Male, from Michigan, sublimate to balsam.

CYATHOLAIMUS, Bastian, 1865.

Fig. 17, Plate VI.

15. <i>Cyatholaimus truncatus</i> , n.sp.	1.6	7.1	14.	26.	88.	1.6 mm.
	1.8	2.	2.1	3.3	2.1	

The moderately thick layers of the transparent, colorless, naked cuticle are traversed by about fifteen hundred transverse striae, resolvable into transverse rows of distinct dots, which are not very materially modified in the lateral fields. The slightly conoid neck ends in a truncated head, whose lip region is set off by an almost imperceptible expansion. The cuticle becomes somewhat thicker toward the head, and the dotlike markings more distinct and refractive. Beginning near the head and ending near the spinneret there are circular markings arranged in somewhat irregular rows along the lateral fields. The longitudinal distance between these markings near the middle of the body is a little greater than the radius of the body, and the diameter of the circles is somewhat greater than the width of one of the annules, sometimes twice as great. These markings are not all of the same size, some being nearly twice as large as others.* The lip region is twelve-parted, and there are twelve longitudinal chitinous structures surrounding the vestibule. These no doubt indicate the infolding of the lips when closed. Probably the best conception of the lip region is expressed by saying that there are six lips, each two-parted, but that the divisions are all very similar to each other. On the front of the lips there are six forward pointing innervated papillae arranged in the usual position. Along the outer margin of the head there are ten acute, tapering, cephalic setae, two lateral, and four submedian pairs. The longest of these setae are about equal to the radius of the head. According to the position of the lips these setae vary in attitude. They may be folded together on the front of the head so as to be in the position of the spokes of a wheel, but they may point forward when the mouth is partly open, and are in a somewhat spreading position when the mouth is wide open. The pharynx is on the whole conoid, and about three-fourths as deep as the head is wide. Springing from a little behind its middle is a strong, conical, acute, forward pointing dorsal tooth, the ventral contour of which lies approximately in the axis of the

*The two most pronounced rows are nearly opposite the edges of the lateral fields, but there is an irregular median row.

head. Surrounding the pharynx the muscles are somewhat more powerful than in the oesophagus immediately behind, so that there is a very faint pharyngeal bulb. The oesophagus is at first about two-thirds as wide as the corresponding portion of the neck, but gradually enlarges after passing through the nerve-ring, so that finally it is two-thirds as wide as the base of the neck. The lining of the oesophagus is a distinct feature throughout its length. There is no very distinct cardia. There are no eye-spots. The amphids, which are about one-third as wide as the head, are spirals of about two and one-half winds, and are placed opposite the apex of the dorsal tooth. The intestine, which is separated from the oesophagus by a distinct constriction, is at first one-half to two-thirds as wide as the body, but in the greater part of its length is about two-thirds as wide as the body. It is thick walled, and is composed of cells of such a size that comparatively few are required to build a circumference, probably about six. The cells contain rather numerous, conspicuous, brownish granules of variable size, the largest of which have a diameter about equal to double the width of one of the annules of the cuticle, the smallest of which are very much smaller. These granules are arranged irregularly, and can hardly be said to suggest any tessellation. From the broad, raised anus the rectum, which is refractive and nearly as long as the anal body diameter, extends inward and forward. The tail is conoid to the subacute conoid spinneret, which has a diameter about one-eighth to one-tenth as great as that of the base of the tail. There do not appear to be any caudal setae. The lateral fields appear to be fully one-third as wide as the body. The nerve-ring surrounds the oesophagus somewhat obliquely. The excretory pore appears to be situated at a distance from the anterior extremity about two and one-half times as great as the width of the head. The renette cell appears to be small and located some distance behind the base of the neck. From the elevated vulva the vagina leads inward at right angles to the ventral surface about half way across the body, where it joins the two-parted uterus. The reflexed, tapering ovaries reach about two-thirds the way back to the vulva, and contain a dozen or more developing ova arranged somewhat irregularly, especially toward the blind end. The rather thin shelled ovate to ellipsoidal eggs are a little longer than the body is wide, and about two-thirds as wide as long. They have been seen to occur in each uterus one at a time, and are apparently deposited before segmentation begins.

59.

$$\begin{array}{rcccccc} 1.7 & 6.6 & 15. & -M & 91. & \\ \hline 1.6 & 2.2 & 2.3 & 2.3 & 2.6 & 1.6 \text{ mm.} \end{array}$$

The tail of the male is like that of the female in form and size, but the anus is more prominently elevated. There is a row of four small pre-anal, ventral, tubular, protrudable supplementary organs. The final one of these is opposite the middle of the spicula; the penultimate nearly opposite the proximal ends of the spicula. The foremost is about three times as far from the anus as the penultimate. From this it will be seen that the organs

are slightly more nearly approximated to each other posteriorly. These organs are not conspicuous features, and scarcely disturb the ventral contour. It is possible that each is connected with a unicellular glandular structure nearby. The two equal, tapering, somewhat arcuate spicula are one and one-third times as long as the anal body diameter. Their proximal ends are cephalated by expansion. The accessory pieces alongside are four-fifths as long as the spicula, and somewhat broader than the spicula. In their widest part they are one-sixth as wide as the corresponding portion of the body. They are of rather uniform width throughout. There is a slight constriction near each end, and the distal extremity appears to be very minutely dentate. The spicula are about half as wide as the accessory pieces. The ejaculatory duct is two-thirds as wide as the corresponding portion of the body, as is also the testis. The blind end is as far behind the base of the neck as this latter is behind the anterior extremity.

Habitat: Silver Springs, Fla. Flemming solution to glycerine.

ETHMOLAIMUS, de Man, 1880.

Fig. 19, Plate VII.

16. <i>Ethmolaimus americanus</i> , n.sp.	2.5	10.2	18.4	²⁷ '54'	90.3	.6 mm.
	2.4	3.4	3.9	5.6	2.1	

The thin, transparent layers of the practically naked cuticle are traversed by very fine transverse striae, resolvable with high powers into rows of closely set dots, which are not modified on the lateral fields. Near the head the dots are a little coarser than elsewhere on the anterior portion of the body. On the tail the dots are much farther apart and, though really arranged in transverse rows, at first glance appear to be scattered irregularly. The conoid neck ends in a somewhat truncated head, which bears on its outer margin a circlet of four slender, spreading submedian cephalic setae, each about half as long as the head is wide. There appear to be twelve minute papillae in the lip region, which when folded together forms a rather small, cyathiform cavity, in the midst of which stands the thumb-shaped, forward-pointing dorsal tooth. This tooth is attached to a distinctly thickened rib of chitin, which extends from the lip region back to the base of the pharynx, and is thicker anteriorly than it is posteriorly. This thickened dorsal rib causes the pharynx to appear somewhat more strongly built on the dorsal side than on the ventral side. The tooth tapers slightly to a blunt point, and has a length about one-fourth as great as the width of the front of the head. Behind it the pharynx is somewhat prismoid and approximately one-fifth as wide as the head. It ends abruptly at the base. The pharynx is surrounded by a pharyngeal bulb, the musculature of which is set off distinctly from that of the oesophagus, in addition to which there is a constriction between the bulb and the oesophagus. The somewhat obscure, slender, apparently spiral amphids consist of about one and one-half winds. They are located opposite the posterior portion of the pharynx, and are one-

third as wide as the corresponding portion of the head. There are no eyespots. The oesophagus begins as a tube three-fifths as wide as the base of the head, and it continues to have this diameter until it expands rather suddenly to form a somewhat ellipsoidal or obscurely pyriform cardiac bulb, which is four-fifths as wide as the base of the neck, and contains an obscure, elongated, relatively narrow valvular apparatus. The lining of the oesophagus is a distinct feature throughout its length. There is no very distinct cardia, but the preliminary cells of the intestine are different from those which immediately follow. The rather thick-walled intestine is separated from the oesophagus by a deep and distinct constriction, and becomes at once about half as wide as the body. Thereafter it widens out gradually so as to become three-fourths as wide as the body. It is composed of cells of such a size that probably about six to eight are required to build a circumference. The cells contain granules of variable size, the largest of which have a diameter half as great as that of the terminus of the tail. From the rather inconspicuous but slightly depressed anus the rectum, which is about as long as the anal body diameter, extends inward and forward. The body begins to taper slightly from some distance in front of the anus, but tapers more rapidly behind the anus in such fashion that at the beginning of the posterior fifth the diameter is about one-sixth as great as at the anus; thence onward the tail is cylindroid, and ends in a tubular spinneret, less than half as wide as the terminus. The spinneret tapers slightly to a blunt point, and is armed at its base with one or more setae as long as itself. The caudal glands appear to be located in the base of the tail. The lateral fields are well-developed and fully one-third as wide as the body. The renette cell appears to be located a short distance behind the cardiac bulb. The position of the excretory pore is unknown,—possibly it is at the base of the lips. The nerve-ring surrounds the oesophagus somewhat obliquely. From the elevated, rather broad vulva the vagina leads inward at right angles to the ventral surface fully half way across the body, where it joins the symmetrically-placed uteri. The reflexed ovaries reach as far back as the vulva,—at least in specimens in which the uteri contain no eggs. The fully developed ova are nearly twice as long as the body is wide and about one-third as wide as long. The form, size and number of the eggs remains undetermined, but it seems probable that they occur in the uteri one at a time.

Habitat: Spring, Washington Country Club, Chevy Chase, Md.
Sublimate to balsam.

MONHYSTERA, Bastian, 1865.

Fig. 20, Plate VII.

				62.		
	.6	8.7	22.	-72.	88.	
17. <i>Monhyстера sentiens</i> , n.sp.	1.6	3.1	4.3	4.8	3.1	1.6 mm.

The thin, transparent layers of the colorless cuticle are traversed by about eight hundred transverse striae, resolvable with difficulty into rows of

somewhat dotlike elements. These striae are more readily visible toward the extremities, especially the posterior extremity. The conoid neck becomes convex-conoid toward the head, which is somewhat rounded. Throughout the body there are rather numerous, long, slender somatic setae having a length equal to the radius of the body. These setae are a little longer toward the extremities than they are near the middle of the body. On the outer margin of the head, a trifle in front of the base of the pharynx, there are ten spreading, tapering cephalic setae, one on each lateral line, and two of somewhat unequal size on each submedian line. The longest of these setae are more than half as long as the head is wide. A little more than twice as far back as the amphids there is a rather definite circlet of cervical or subcephalic setae arranged in submedian positions. The lips appear to be three in number, and are longitudinally striated or fluted. The thin flap-like, striated portions are capable of assuming a revolute position. The basal portion of the lip region is considerably thicker than the flaps, and is arched over the margin of the pharynx. This latter is wide and shallow. Just beneath the lips it is two-thirds as wide as the front of the head. It closes together rapidly, so that its base is located at a distance from the anterior extremity about equal to the radius of the head. In other words, the posterior portion of the pharynx is about half way back to the amphids. These latter are circular, and one-third to one-fourth as wide as the corresponding portion of the head. Their distance from the anterior extremity is about equal to half the width of the front of the head. A short distance in front of each amphid there is a granular nucleus, which closely resembles the nerve cells that are found in the neck, and seems doubtless to be the nucleus of the nerve cell which is connected in some way with the function of the amphids. The oesophagus reaches to the base of the lips, and into it is set the posterior portion of the pharynx. At first the oesophagus is only two-thirds as wide as the base of the head. It continues to have this diameter, or a little more, until after it passes through the nerve-ring. Thence onward it gradually increases so that finally it is about two-thirds as wide as the base of the neck. The lining of the oesophagus is a fairly distinct feature. The intestine, which is separated from the oesophagus by a distinct constriction, is composed of cells of such a size that probably six to eight are required to build a circumference. The anterior portion of the intestine is somewhat bulbous in form, and is separated from the oesophagus on the one side and the true intestine on the other, by a pair of constrictions. This portion may be looked upon as a strongly developed cardia. The intestine is moderately thick walled, and ends posteriorly in a short, wide rectum, hardly as long as the anal body diameter. The posterior extremity of the female begins to taper from near the vulva, and continues to taper at about the same rate behind the tail as in front of it. The tail itself is conoid in the anterior four-fifths, and cylindroid in the posterior fifth. The terminus is hardly swollen, and is about one-sixth as wide as the base of the tail. The spinneret is rounded and bears a couple of submedian setae twice as long as its own

diameter. The three caudal glands are located in the anterior third of the tail. The lateral fields vary in width in different parts of the body. A little in front of the anus they are about two-fifths as wide as the corresponding portion of the body, and contain rather numerous scattered nuclei of such a size that about eight would be required to reach across the field. Farther forward the field is narrower, about one-fourth as wide as the middle of the body. Anteriorly it is wider, about one-third as wide as the base of the neck. Nothing is known concerning the renette. The nerve-ring surrounds the oesophagus somewhat obliquely a little in front of the middle of the neck. From the elevated and rather large and conspicuous vulva the vagina leads inward at right angles nearly half way across the body, where it joins the single uterus, which extends forward, and is of such a size as to contain apparently but one egg at a time. The ovary, which at first is three-fourths as wide as the body, extends forward and tapers gradually, so that at the blind end, considerably in front of the cardia and a short distance behind the nerve-ring, it is one-fourth as wide as the corresponding portion of the body. It sometimes happens that the blind end of the ovary is disposed in a single coil. The rather thick shelled eggs are as long as the body is wide, and about three-fourths as wide as long, and appear to be deposited before segmentation begins. The small spermatozoa found in the uterus are of such a size that at least ten placed side by side would be required to span the diameter of one of the eggs. There is a very small, posterior rudimentary branch to the uterus, which extends backward from the vulva a distance about equal to two-thirds the radius of the body. Around the vulva are four distinct, unicellular vaginal glands.

71.

.7	9.4	22.	-M-	87.	
1.6	2.9	3.5	4.2	3.3	1.5 mm.

The tail of the male resembles that of the female in form and size. As in the females, the three caudal glands are found in the anterior third of the tail, and do not extend materially farther forward than the anus. The two equal, L-shaped, slender, slightly tapering brownish spicula are a little longer than the anal body diameter. The anterior three-fifths lie nearly parallel to the body axis, while the posterior two-fifths are arranged nearly at right angles to the body axis. The distal extremities of the spicula are slightly widened. At their widest part, namely near the proximal ends, the spicula are about one-eighth as wide as the corresponding portion of the body. They are very slightly narrower distally than proximally, where they are barely cephalated by expansion. The accessory piece is not strongly developed. The main portion of it lies parallel to the distal two-fifths of the spicula, and is connected with the dorsal surface of the body by means of muscles. The ejaculatory duct is one-half as wide as the corresponding portion of the body. There are two outstretched testes. The blind end of the anterior testis is located a short distance behind the nerve-ring, while the blind end of the posterior testis is located about as far in front of the

anus as the terminus is behind it. The testes are broad and some parts appear to fill up the main portion of the body cavity.

Habitat: Sand bar off Plummer's Island, Potomac River. Sublimate to balsam.

ONCHOLAIMELLUS, de Man, 1886.

Fig. 21, Plate VII.

18. *Oncholaimellus heterurus*, n.sp. $\frac{.9 \quad 8.5 \quad 18. \quad -M- \quad 91.}{.8 \quad 1.5 \quad 1.8 \quad 1.8 \quad 1.4} \frac{53}{1.2 \text{ mm.}}$

The moderately thick layers of the transparent, naked, colorless cuticle seem to be destitute of markings of any kind. If there are any striations they must be exceedingly minute. The conoid neck becomes a little convex-conoid toward the head, which is subtruncated, and has a lip region almost imperceptibly expanded. There are ten long, curved, tapering, cephalic setae, located a trifle in front of the middle of the pharynx, two lateral, and eight submedian. The members of the submedian pairs are placed one in front of the other, the hinder members being only about two-thirds as long as the forward members. It is the forward members that are in the same circlet with the lateral setae. These latter are about as long as the longest submedian setae. The bases of the lips are nearly as thick as the wall of the head, but they gradually become quite thin, though the flaps are not so marked as they usually are in *Oncholaimus*. There are six lips, and each bears on its anterior surface, near the margin of the head, a somewhat outward pointing, minute, innervated papilla, which does not very markedly interfere with the contour of the front of the head. The somewhat cylindroid pharynx is about twice as long as the front of the head is wide, and the average diameter of the cavity is a little more than one-third of its length. At the middle the pharynx is about half as wide as the corresponding portion of the head. Its walls are fairly well chitinized, and appear to be destitute of onchi. The description is derived from a single specimen, in which the mouth is filled with detritus, and it is possible that very minute teeth might have escaped observation, but this does not seem at all probable. The bottom of the pharynx where it is set on the end of the oesophagus, is in the shape of a broad, shallow, hollow cone. At a distance from the anterior extremity twice as great as the length of the pharynx the amphids are seen. These are somewhat elongated, roughly ovate in contour, and more distinctly marked anteriorly than posteriorly. The anterior border is a curved, chitinous structure about one-third as wide as the corresponding portion of the head. Slightly behind the anterior border the amphid has its greatest diameter. It is about as long as the corresponding radius of the head, and is extended backward by an apparently tubular structure, which soon becomes indefinite. Viewed dorso-ventrally the amphids appear like rather deep invaginations of the cuticle, and each occupies fully half of the

corresponding radius of the neck, and opposite them the oesophagus is a trifle narrower than it is either in front of or behind them. The oesophagus, which at first is about half as wide as the base of the head, continues to have approximately the same diameter until after it passes through the nerve-ring, which is somewhat in front of the middle of the neck. Behind the nerve-ring the oesophagus becomes somewhat wider, and is finally about two-thirds as wide as the base of the neck. The lining of the oesophagus is a fairly distinct feature. The intestine, which becomes at once nearly three-fourths as wide as the body, is set off from the oesophagus by a distinct constriction. There does not appear to be any well developed cardia. The cells composing the intestine contain scattered granules, which give rise to a very obscure tessellation, and also contain doubly refractive granules, which, however are not spherical in form, though their diameter in different directions is not very variable. The tail of the male tapers rapidly from the anus, so that at the end of the anterior fourth it has a diameter but little greater than that of the terminal spinneret. Near the anterior end of the cylindrical part there occur a pair of subventral arcuate, tapering setae, which are about as long as the corresponding diameter of the tail. In front of these there is a ventrally submedian pair of papillae, and also there is a dorsally submedian pair a little in front of these latter. The spinneret is of a simple character, and has the terminus almost imperceptibly swollen. There do not appear to be any setae on the spinneret. A trifle in front of the proximal ends of the spicula there springs from a ventrally submedian line a somewhat weakly developed bursa, which extends slightly beyond the body contour, but only does this in front of the anus. It recedes into the cuticle at a point slightly in front of the caudal setae. This bursa does not have any ribs and is not striated in any way. The two equal, elongated, rather uniform, slightly cephalated spicula are a little more than twice as long as the anal body diameter, and in their anterior halves are nearly straight. In their posterior halves they are slightly arcuate. At the point where they attain their greatest width they are about one-fourth as wide as the corresponding portion of the body. Seen dorso-ventrally they are somewhat narrower and straighter than when seen in profile. The accessory piece appears to be compounded of a number of small chitinous elements, the whole structure being a little less than one-third as long as the spicula. It is not very strongly developed, and is not a very conspicuous feature. The ejaculatory duct is about half as wide as the corresponding portion of the body. There are two testes outstretched in opposite directions. The blind end of the anterior testis is about as far behind the base of the neck as this latter is behind the anterior extremity. The posterior testis is smaller, but just how much smaller is unknown, as its blind end could not be located in the single specimen examined. Little or nothing is known concerning the lateral fields and the renette.

Habitat: Fresh water pond, near Ocala, Fla. Bouin solution to glycerine.

Note: There is some doubt as to whether this species should be assigned to the genus *Oncholaimellus* for the following reasons: There are no pharyngeal teeth. The amphid varies somewhat from that of the type species. The spicula are of equal size, whereas in the type species one of the spicula is only half as long as the other.

CEPHALOBUS, Bastian, 1865.

Fig. 22, Plate VIII.

19. **Cephalobus sub-elongatus**, n.sp. $\frac{1.8}{1.6} \frac{15}{3} \frac{23}{3.6} \frac{51}{4.3} \frac{94}{2.1} .6 \text{ mm.}$

The thin, transparent, colorless layers of the naked cuticle are traversed by about seven hundred plain, transverse striae, resolvable with high powers without very much difficulty. The conoid neck becomes convex-conoid toward the obscurely lobed head, which is rounded in front, and is set off by an almost imperceptible, broad, exceedingly shallow constriction. There are no cephalic setae, and no eye-spots; no amphids have been seen. There are three rather distinct, bluntly conoid lips, which are rounded in front, each of which apparently has two inconspicuous innervated papillae. The open vestibule leads to a conoid pharynx, which is about one and one-half times as long as the lip region is wide, and tapers from front to back in a comparatively uniform way. Between the lips it has a width about one-third as great as that of the lip region. The posterior half of the pharynx rests in the anterior end of the oesophagus, which enlarges very perceptibly, so that a little behind the base of the pharynx it is more than half as wide as the corresponding portion of the head. It continues to have relatively much the same width until near the middle, where it is about three-fifths as wide as the middle of the neck. There it suddenly diminishes in size so as to be only one-fourth to one-fifth as wide as the corresponding portion of the neck. Passing through the nerve-ring with this narrow diameter it finally enlarges to form an ellipsoidal cardiac bulb about two-thirds as wide as the base of the neck, containing a rather distinct triplex but not very complex valvular apparatus of the form usually seen in this genus. There is no very definite cardia. The intestine, which is separated from the oesophagus by a rather broad and shallow constriction, is at first only half as wide as the corresponding portion of the body. It soon becomes thicker walled, and enlarges so as to be three-fourths as wide as the corresponding portion of the body. It is composed of cells of such a size that probably only about two are required to build a circumference. The contents of the cells are not distributed so as to give rise to anything distinct in the way of tessellation. The posterior lip of the anus is very slightly elevated. From the anus the rectum, which is somewhat longer than the anal body diameter, leads inward and forward. The rectum is separated from the intestine by a rather distinct constriction. The tail is at first convex-conoid, the convexity existing

almost entirely on the dorsal surface. Through the middle third the tail tapers much more rapidly than elsewhere, so that at the beginning of the posterior fourth it has a diameter no more than one-fifth as great as at the anus. Thence onward it is conoid to the acute terminus. There is no spinneret. Very little is known concerning the lateral fields, but at the middle of the body they appear to be one-third as wide as the corresponding portion of the body. There do not appear to be any distinct wings. The excretory pore is located opposite the nerve-ring. This latter surrounds the oesophagus obliquely, and is accompanied by nerve cells, of which the greater number are behind the nerve-ring and in front of the cardiac bulb. From the massive elevated vulva the rather strongly chitinated, slightly colored vagina leads inward at right angles to the ventral surface nearly half way across the body, where it joins the single uterus, which extends forward. In specimens which do not yet contain fully developed eggs, and in which the uterus is occupied by spermatozoa, the flexure in the sexual apparatus occurs about half way between the vulva and the base of the neck. The ovary extends straight backward, and finally tapers to a blunt end a short distance in front of the anus. At the rear end the ovary is one-half as wide as the corresponding portion of the body. The ova appear to be arranged more or less single file in the greater part of the ovary, whose walls contain distinct nuclei of relatively large size. These nuclei are of such a size that about six to eight placed side by side would reach across the body, and are removed from each other in a longitudinal direction a distance equal to about two-thirds of the body diameter. None of these cells could be seen in that portion of the sexual tube in front of the vulva, and it is surmised that the cells composing the ovarian tube are markedly different in their character from those composing the tube between the ovary and the uterus and those composing the wall of the uterus. The spermatozoa have been seen packed in the uterus somewhat like a roll of coin, though each one is thinner at the margins than at the center where the nucleus exists. The spermatozoa are of such a size that the uterus may contain about two dozen, arranged single file.

Habitat: Moss, Bog. W. End of Douglas Lake, Mich. This species closely resembles *C. elongatus* de Man, and possibly may prove to be the same. At present, judging from a single specimen it appears to differ in the following points: (1) The tail of the female is of different form, since that of *elongatus* is nearly conical; (2) No wings have been seen on *sub-elongatus*, while they appear to be a marked feature of *elongatus*; (3) There is no expansion of the lip region in *elongatus* as in *sub-elongatus*; (4) The vulva in *sub-elongatus* is far more massive; (5) the pharynx in *elongatus* is more elongated, and longer as compared with the length of the head; (6) oesophagus is relatively slenderer in *elongatus*. Sublimate to balsam.

20. <i>Cephalobus setosus</i> , n.sp.	2.5	15.	31.6	Y	94.	.7 mm.
	2.7	4.	4.1	4.5	3.	

The moderately thick layers of the naked, transparent, colorless cuticle are traversed by 425 transverse striae, which are not further resolvable.

The striae are more or less interrupted on the lateral fields by two wings, or by a single wing indicated by two longitudinal lines. The width of the wing near the middle of the body is about equivalent to the width of four of the annules of the cuticle. Toward the tail end the width of the interrupted space is about equivalent to the width of three of the annules, and near the middle of the neck the width is also about equivalent to that of three of the corresponding annules. Through the middle of the lateral space on which the annules are interrupted there passes a longitudinal refractive line. The posterior portion of the neck is cylindroid; the anterior half conoid to the head, which is not set off in any way. The lips are arranged in two series: an outer series of six two-parted lips, and an inner series of three obscurely two-parted projecting flaps, each armed at the anterior rounded corners with short, arcuate, tapering, acute, forward-pointing bristles. Each of the two parts of the six outer lips or appendages is conoid and acute, and the spaces separating them are much narrower than those separating the lips themselves. At the base of each of the lateral two-parted lips there is a transverse mark, which may possibly be the outer expression of the amphid. This marking is very minute and about four times as wide as it is long, and is placed transversely on the base of the lip, just in front of the foremost cervical annule. It spans about one-sixth of the width of the head at this point. The three inner appendages, which may more properly be termed the lips, are about as long as they are wide, and seem to be flexible. They rather closely surround the mouth opening. Each is half as wide again at its free extremity as it is at the base, and the total length is about equal to one-fourth of the diameter of the front of the head. The setae with which these lips or flaps are armed are about two-thirds as long as the flaps themselves. The rather obscure, narrow, cylindroid pharynx is about as long as the base of the head is wide, and its lumen is hardly wider than the thickness of the cuticle. The oesophagus surrounds the pharynx, but is narrower in this region than it is immediately behind the pharynx. Behind the pharynx it commences as a tube about three-fifths as wide as the base of the head, and continues to have about the same diameter until after it passes through the nerve-ring. It does increase a trifle in diameter, however, so that at the nerve-ring it is about one-half as wide as the corresponding portion of the neck. Some distance behind the nerve-ring, namely, at a distance about equal to one and one-half diameters of the neck, there is a slight break in the musculature of the oesophagus. Behind this break the oesophagus begins to taper very gradually and continues to decrease in diameter until it finally expands to form the somewhat ellipsoidal or pyriform cardiac bulb, which is about two-thirds as wide as the base of the neck, and contains a distinct, rather simple, triple, chitinized valvular apparatus. That portion of the oesophagus immediately in front of the cardiac bulb has a diameter about one-fourth as great as that of the corresponding portion of the neck. The lining of the oesophagus can be seen throughout its length, and is a fairly distinct feature. The intestine which at first is thin-

walled is separated from the oesophagus by a distinct and deep constriction, and becomes at once about three-fourths as wide as the body. The anterior portion of the intestine is characterized by the presence of a considerable cavity, which, however, soon narrows, and, as the internal wall of the intestine is rather strongly refractive, the narrow, sinuous lumen is a very conspicuous feature. From the rather conspicuous depressed anus the rectum, which is rather strongly chitinized and somewhat longer than the anal body diameter, extends inward and forward. The tail is somewhat concave conoid from the anus to the very acute terminus. There are no caudal glands. The lateral fields appear to be about one-third as wide as the body. The nerve-ring surrounds the oesophagus somewhat squarely. The excretory pore appears to be located near the nerve-ring. The nature of the internal sexual organs remains uncertain, but the vulva is evidently located near the middle of the body. The description is derived from an immature specimen.

Habitat: Cranberry bog, Arlington Farm, Virginia. Flemming solution to glycerine.

BASTIANA, de Man, 1876.

Fig. 23, Plate VIII.

21. <i>Bastiana exilis</i> , n.sp.	.2	8.	18.	58.	89.	1.4 mm.
	.5	.8	1.	1.5	1.1	

The moderately thick layers of the transparent, colorless, naked cuticle are traversed by about eight hundred forty transverse striae, which do not appear to be further resolvable. These striae exist in the outer as well as inner cuticle, so that the entire contour of the body is crenate. Rather conspicuous lateral wings are present, the optical expression of which is two distinctly refractive longitudinal lines opposite the lateral fields, separated from each other by a distance somewhat greater than the width of one of the annules of the cuticle. The gradually tapering conoid neck ends in a somewhat truncate head, which is not set off in any way, and which bears a circlet of at least six cephalic setae, of which four submedian are the longer, and somewhat longer than the head is wide. Possibly each of these latter is accompanied by a shorter seta, thus making ten in all. Apparently labial papillae are present, but they have not been sufficiently clearly seen to permit of enumeration. There is no distinct pharynx. The amphids, located as in *B. gracilis* deMan, are somewhat in the form of the end of a shepherd's crook. They are perhaps to be regarded as broad spiral bands of about one turn. So regarded, the band may be conceived to begin on the ventral side where its end is rounded and its contour distinct, pass forward, and then curve backward and end indefinitely at a point somewhat in the rear of the beginning. The amphids are half to two-thirds as wide as the corresponding portion of the neck, and somewhat longer than wide. There are no eye-spots. The oesophagus begins as a tube fully two-thirds as wide as the head. It gradually increases in diameter as it passes backward, and at

its posterior extremity is three-fourths as wide as the base of the neck. There is no definite cardia. The lining of the oesophagus is indistinct. The intestine, which is separated from the oesophagus by an obscure constriction, becomes at once three-fourths as wide as the body, is rather thick walled, and its cells contain rather uniform, colorless granules, not arranged in any definite manner. From the rather raised anus the conspicuous rectum, which is twice as long as the anal body diameter, extends inward and forward. The tail is conoid, but tapers more rapidly near the acute terminus. A short distance in front of the terminus it is nearly half as wide as at the base. Nothing is known concerning the renette. The lateral fields have not been distinctly seen, but they appear to be about one-third as wide as the body. Nothing definite is known concerning the internal sexual organs, as the specimens examined were not fully developed.

28.

.4	6.	19.	-M-	92.	
.5	1.2	1.4	2.	1.2	1.4 mm.

The tail of the male is like that of the female in form and size, except that the anus is more prominently raised. In front of the anus and extending forward to the base of the neck there is a ventral row of ninety supplementary organs. These are of small size, and each appears when seen in profile to be a slight conical, innervated elevation having an altitude about one-third as great as the width of its base. These organs are removed from each other a distance on an average about equal to the radius of the body or a little more. They are somewhat nearer together posteriorly than anteriorly. Near the base of the neck the distance between two adjacent organs is about equal to the body diameter. The two equal, tapering, acute, nearly straight spicula are about one and one-third times as long as the anal body diameter. They are slightly cephalated by expansion, the cephalum occupying about one-third of the length. At the widest part, namely in the cephalum, the spicula are one-fourth to one-third as wide as the corresponding portion of the body. They do not appear to have any accessory pieces. The spicula appear, when seen in profile, to be arranged at an angle of forty-five degrees to the body axis. Beginning at the anus and extending obliquely backward there is a strand of muscle which is attached to the dorsal side of the body. The two testes are outstretched in opposite directions. The blind end of the anterior testis is about as far behind the base of the neck as the nerve-ring is in front of it, while the blind end of the posterior testis is about twice as far in front of the anus as this latter is in front of the terminus.

Habitat: Fresh water, Tynne Station, Fla. Bouin solution to glycerine.

APHANOLAIMUS, de Man, 1880.

Fig. 25, Plate VIII.

22. <i>Aphanolaimus spiriferus</i> , n.sp.	.5	8.8	20.	^{43.} '50.'	88.	1.5 mm.
	.7	1.5	2.1	3.1	1.9	

The thin, transparent layers of the colorless, naked cuticle are traversed by about one thousand transverse striae, which do not appear to be further resolvable, or at any rate are resolvable with difficulty. The cuticle is also traversed by longitudinal striations, manifestly due to subcuticular structures,—the submedian fields—and the attachment of the muscle cells. The contour of the body is minutely crenate. There is a distinct wing extending throughout the length of the body, whose presence is indicated by two refractive lines occupying a space hardly greater than the width of one of the annules of the cuticle. On being carefully examined these lines show traces of the striations of the cuticle. The conoid neck ends in a somewhat rounded head, whose lip region is set off by a minute constriction just in front of the amphids. The contour of the front of the head is rounded, or, like that of a very flat truncated cone. In the midst of the truncation there is an exceedingly minute depression, the mouth pore. There does not appear to be any very distinct pharynx, but the lining of the oesophagus is slightly altered in the region of the head back as far as the posterior margins of the amphids. It is not unlikely that this represents a distinct, though rudimentary pharynx. The species, however, would naturally at first sight be classed as being without a pharynx. The oesophagus begins as a tube about half as wide as the base of the head, and expands very gradually until after it passes through the nerve-ring. At the nerve-ring its width is about one-third that of the corresponding portion of the neck. Behind the nerve-ring the oesophagus begins to expand a little more rapidly, though still slowly. When it reaches the end of the neck it is half as wide as the base of the neck. For a distance equal to one body diameter, however, it decreases in size, so that where it joins the intestine it is very narrow, only about one-fifth as wide as the corresponding body diameter. Nevertheless, there appears to be a distinct, though exceedingly minute cardia. The lining of the oesophagus is a fairly distinct feature throughout its length. The intestine, which is at first thin-walled, gradually becomes half as wide as the body, and is composed of cells of such a size that only two or three are required to build a circumference. For the most part the wall of the intestine is moderately thick. From the very slightly raised, rather inconspicuous anus the slender rectum, which is about one and one-half times as long as the anal body diameter, extends inward and forward. It is separated from the intestine by a very distinct and deep constriction. Near the middle the lateral fields are about one-third as wide as the body. The ventral gland is a rather elongated, saccate cell a little longer than the base of the neck is wide, and about one-third as wide as long. It contains a large spherical nucleus,

with a large, fairly distinct nucleolus. There extend backward from this cell two finger-shaped, submedian extensions nearly as long as the cell itself. Notwithstanding the distinctness of the organ and appendages the position of the excretory pore remains to be discovered. The tail tapers from in front of the anus in such fashion that at the beginning of the final fourth it has a diameter about one-fourth as great as at the anus. Thence onward the tail is cylindroid to the terminus, which bears a truncated, conical, unarmed spinneret. The three caudal glands are minute, close together, opposite to and a little behind the anus. From the slightly depressed vulva the chitinized vagina leads inward at right angles to the ventral surface half way across the body, where it joins the two symmetrically placed uteri. The reflexed ovaries reach about one-third the distance back to the vulva and contain a few developing ova arranged single file. The species is viviparous. Two embryos and a developing egg have been seen in each uterus at the same time. The eggs are somewhat elongated, about as long as the body is wide, and a little less than half as wide as they are long.

64					
.2	10.	14.(?)	M	82.	
.7	1.1	2.	2.4	1.9	1.5 mm.

The tail of the male is like that of the female in form and size. In front of the anus there is a ventral series of seven tubular, protrudable, supplementary organs, occupying a space nearly equal to the length of the tail. The hindermost is opposite the proximal ends of the spicula. Each of these organs is about half as long as the body is wide, has its proximal end slightly cephalated by expansion, and its distal end slightly curved. The circular apertures through which the organs are protruded disturb the ventral contour distinctly, each of them occupying a space about equal to the width of four annules of the cuticle. There are no special setae or papillae either in front of the anus or behind it. The two equal, uniform, slender, very strongly arcuate spicula are about one and one-half times as long as the anal body diameter, and their proximal ends are cephalated by expansion. The proximal ends lie nearly opposite the body axis. There is a simple accessory piece, applied for a short distance to the distal ends of the spicula, having a backward pointing process two-thirds as long as the anal body diameter.

Habitat: Potomac River, Washington, D. C. Sublimate to balsam.

31					
23. <i>Aphanolaimus minor</i> , n.sp.	.7	13.8	20.7	'50'	85.4
	.8	3.3	3.9	4.7	2.6
	.6 mm.				

The moderately thin, transparent layers of the colorless, naked cuticle are traversed by fine transverse striae, resolvable with moderate powers, and not modified on the lateral fields. The presence of wings is indicated by two lines extending from near the middle of the neck well onto the tail.

These occupy a space a little more than the width of one of the annules of the cuticle, but sometimes one of these lines is more prominent than the other. The conoid neck ends in a rounded head, which is not set off in any way. There are no cephalic setae. There does not appear to be any distinct pharynx. The lining of the oesophagus is slightly modified back twice as far as the posterior margins of the amphids, and very likely this portion of the tube may be regarded as a narrow rudimentary pharynx. Twice as far from the anterior extremity as the base of this supposed pharynx the oesophagus is distinctly interrupted by a break in the musculature, although there is no change in size, and just behind this break there are three distinct, elongated nuclei, one in each segment of the oesophagus. These appearances are reminiscent of the arrangement in *Plectus*, to which *Aphanolaimus* is doubtless related. There do not appear to be any distinct lips, though possibly there may be three exceedingly minute, well amalgamated, flattish ones. Although at first glance the amphids appear to be circular, they are really spiral in form. They are about one-fifth as wide as the corresponding portion of the neck. Their distance from the anterior extremity is about equal to the diameter of the head; or in other words, their centers are removed from the anterior extremity a distance about twice as great as their diameter. The amphids appear to be slightly larger in the male than in the female. There are no eye-spots. The oesophagus begins at the base of the above described pharynx, as a tube about half as wide as the corresponding portion of the neck. It widens very gradually, so that where it passes through the nerve-ring it is nearly one-third as wide as the corresponding portion of the neck. At the middle, nearly opposite the nerve-ring, there is an almost imperceptible increase in diameter, indicative of a deteriorated median swelling. Finally, it expands into the narrowly pyriform *cardiac swelling* destitute of any distinct valvular apparatus. This swelling is half to two-thirds as wide as the base of the neck. The lining of the oesophagus is a distinct feature throughout its length. There is no distinct cardia. The intestine, which is at first only one-fifth as wide as the base of the neck, joins the middle of the posterior surface of the cardiac swelling. It is moderately thick-walled, and gradually becomes about two-thirds as wide as the body. It appears to be made up of cells of such a size that few, probably two or three, or possibly four, are required to build a circumference. The body tapers gradually from a long distance in front of the anus. This latter is very slightly raised, more particularly on the anterior margin. From it the rectum, which is about as long as the anal body diameter, extends inward and forward. The tail is conoid in the anterior three-fourths. The posterior fourth is cylindrical and has a diameter nearly one-third as great as that of the base of the tail. It ends in a rounded, unarmed spinneret, bearing an apiculum. The lateral fields appear to be about one-third as wide as the body. The nerve-ring surrounds the oesophagus somewhat obliquely. There appears to be a small renette cell opposite the anterior portion of the intestine, but the position of the excretory pore has not been discovered.

From the inconspicuous vulva the vagina leads inward at right angles to the ventral surface about half way across the body, where it joins the two symmetrically-placed uteri. The reflexed ovaries reach about half way back to the vulva and contain half a dozen or more developing ova arranged somewhat irregularly. The thin-shelled, ellipsoidal eggs are about as long as the body is wide and about three-fifths as wide as long. They have been seen in the uterus one at a time, and apparently are deposited before segmentation begins.

3.	15.	23.	-M-	85.	
1.8	3.4	3.8	4.2	3.4	.5 mm.

The tail of the male is conoid in the anterior three-fourths in such fashion that the beginning of the final fourth has a diameter of about one-eighth that of the base of the tail; thence onward the tail is nearly cylindrical or expands slightly, and ends in a rounded terminus bearing an apiculum forming an unarmed spinneret. The caudal glands are located in the base of the tail. In front of the anus in the male there is a ventral row of eight or nine protrudable, obscurely S-shaped, yellowish supplementary organs. These appear to be of rather uniform size and are equally spaced. Their length is somewhat greater than that of the radius of the body, and they are placed at an angle of about thirty degrees to the body axis. They are of rather uniform diameter throughout their length, but taper a little toward the blunt distal extremity, and are obscurely cephalated at the proximal ends. The distal extremity of the hindermost of these organs is located nearly opposite the proximal ends of the spicula. The entire distance occupied by the series is about one and one-half times as great as the length of the tail. The two equal, tapering, strongly arcuate, brownish yellow spicula are about one and one-half times as long as the anal body diameter. Their proximal ends are cephalated by expansion, and extending from the proximal ends toward the distal extremities there are straight, refractive lines indicating possibly that there is more to the framework of the spicula than appears at first glance. The spicula curve inward and backward to near the dorsal side of the tail, and then pass forward so that their proximal extremities lie opposite the body axis. The spicula are accompanied by a rather straight, slender, slightly tapering, blunt accessory piece applied to their distal fifths. From this point the accessory piece extends inward and backward at an angle of sixty degrees, and ends a little to the dorsal side of the body axis. At their widest part, just behind the cephalata, the spicula have a width about one-fifth as great as that of the corresponding portion of the body. A little behind the middle of the tail there are two ventrally submedian setae, about half as long as the corresponding diameter of the tail. The ejaculatory duct is about one-third as wide as the body. There are two testicles, one extending forward and the other backward. The blind end of the anterior testicle is a little farther behind the base of the neck than the

nerve-ring is in front of it. The blind end of the posterior testicle lies just in front of the anterior supplementary organ.

Habitat: Mud, Potomac River. Sublimate to balsam.

TYLENCHUS, Bastian, 1865.

60

24. *Tylenchus symmetricus*, n.sp. $\frac{2.7 \ 10.8 \ 17. \ -49- \ 90.2}{1.4 \ 2.8 \ 3.3 \ 3.8 \ 2.7} \ .7 \text{ mm.}$

The moderately thick layers of the transparent, colorless, naked cuticle are traversed by fine plain transverse striae, which are not further resolvable. There are two wings on the lateral fields, removed from each other a distance about equal to one-fourth to one-fifth the body diameter. The space between these wings is very faintly marked with longitudinal lines, of which two near the middle are more prominent than the others. The wings themselves bear traces of transverse striation. These wings begin near the middle of the neck and end on the tail. The conoid neck becomes convex-conoid toward the somewhat rounded head, which is not set off, or at least only by an almost imperceptible constriction a short distance behind the lip region. There are no distinct lips. What appear to be the faintest possible traces of papillae may be seen on the lips, but these do not disturb the rounded contour of the head. Were it not for the innervations it would be practically impossible to see them. The pharynx is tubular and just wide enough to make a passage for the spear. This latter is slender, nearly one and one-half times as long as the base of the head, and has a three-bulbed base about one-fifth to one-fourth as wide as the corresponding portion of the head. Near the middle the spear is closely surrounded by a rather inconspicuous guiding-ring or cylinder, about one-fourth as long as the spear. At its widest part, namely, in the proximal half, the diameter of the spear is less than the width of two of the adjacent annules of the cuticle. The oesophagus begins as a tube about one-third as wide as the base of the head, and continues to have this diameter until it expands to form the ellipsoidal or prolate median bulb. This latter is about three-fifths to two-thirds as wide as the middle of the neck, and contains a distinct ellipsoidal valvular apparatus about one-fifth as wide as the bulb itself. Behind the median bulb the oesophagus is smaller than elsewhere. For a distance equal to twice the width of the neck it has a width only about one-eighth to one-sixth as great as that of the corresponding portion of the neck. Thereafter, it expands to form the elongated-pyriform non-muscular cardiac swelling, which is half as wide as the base of the neck, and contains a rather conspicuous nucleus. The lining of the oesophagus is a fairly distinct feature in its anterior part; but posteriorly it is much less distinct, and is very difficult to observe in the cardiac swelling. The intestine, which is separated from the oesophagus by an indistinct constriction, becomes at once fully two-thirds as wide as the body. Its cells are packed with large granules of somewhat variable size, the largest of which have a diameter about one-eighth as great as that of the body, the smallest being considerably smaller. These

granules are so prominent as to obscure the cellular structure of the intestine. From the very slightly elevated and rather inconspicuous anus the rectum, which is hardly as long as the anal body diameter, extends inward and forward. The tail is conoid to the terminus, where it rather suddenly tapers much more rapidly to a very acute point. This rapidly tapering portion has a length about equal to one-fourth the anal body diameter, and the diameter at the point where the change in taper begins is about equal to one-fifth of the anal body diameter. The lateral fields appear to be a little more than one-third as wide as the body. The nerve-ring surrounds the oesophagus obliquely. The excretory pore is located a little behind the nerve-ring, a little more than half way from the base of the neck to the middle of the median bulb. From the slightly elevated, rather massive vulva the vagina leads inward at right angles to the ventral surface nearly half way across the body, where it joins the two uteri. Apparently the ovaries are outstretched. A single egg has been seen in one of the uteri. It is about twice as long as the body is wide and about one-third as wide as long. It is thin-shelled and apparently undergoes segmentation before being deposited.

53				
3.1	13.5	20.5	-M	80.1
2.2	3.6	3.9	4.2	3.2
.6 mm.				

The tail of the male is like that of the female in form. From the raised anus it is arcuate-conoid to the terminus, which is concave-conoid and ends in an exceedingly fine slender point. The length of the terminus is about one-third as great as the anal body diameter, while its diameter is about one-fourth as great as the anal body diameter. There are no supplementary organs, nor have any special papillae been seen either in front of the anus or behind it. There is a fairly well developed, but not very prominent bursa, which extends but little beyond the ventral contour at any point. It springs from the submedian lines at a distance as far in front of the anus as the middle of the tail is behind it. The bursa is striated like the cuticle, and its margin is entire; it extends to near the end of the tail. Near the middle of the tail there appears to be a bursal rib on each side, which does not reach to the margin of the bursa. The ejaculatory duct is about one-third as wide as the body. The blind end of the single outstretched testicle lies a short distance behind the base of the neck.

Habitat: Marsh in black clay with much decayed vegetation, near *Impatiens*, Arlington Farm, Virginia. Flemming solution to glycerine.

RHABDITIS, Dujardin, 1845.

71				
25.	Rhabditis punctata, n.sp.	1.2	10.8	16.8
		1.2	3.3	4.3
				4.9
				1.6
				93.8
				1.8 mm.

The thin layers of the transparent, naked, colorless cuticle are traversed by transverse striae, which are resolvable with high powers and appear to be resolvable into rows of dots, but there is some doubt about this. The cuticle

is longitudinally striated. Near the middle of the male there is a lateral area nearly half as wide as the body, which is nearly destitute of striations. On either side of this field the cuticle may be seen with high powers to be distinctly longitudinally striated. This lateral field narrows toward both extremities so as to be hardly wider than the spicula, so that the main portion of the cuticle of these regions appears there to be longitudinally striated. The neck is conoid, becoming almost imperceptibly convex-conoid toward the head, which is somewhat rounded and bears six lips, which are fairly well separated from each other, and each of which appears to be papillate. The simple, unarmed pharynx is cylindrical and one-third as wide as the base of the head. Its cavity is four to five times as long as wide. **No amphids** have been seen, and there are no eye-spots. The oesophagus receives the base of the pharynx and becomes at once about two-thirds as wide as the base of the head. It continues to have this diameter until it expands to form the ellipsoidal median swelling, which has a distinctly radiated fibrous structure. This swelling is about two-thirds as wide as the corresponding portion of the neck, and is separated from the portion of the oesophagus preceding it, as well as the portion succeeding it, by a refractive division in the internal musculature. Behind the median swelling the oesophagus has a diameter less than half as great as that of the corresponding portion of the neck, and it narrows continuously until it reaches the pyriform cardiac bulb, which is three-fourths as wide as the base of the neck and contains a well developed, complicated, chitinous valvular apparatus half as wide as the bulb itself. There is no distinct cardia. The somewhat transparent and colorless intestine, which is separated from the oesophagus by a distinct constriction, is composed of cells containing scattered granules of variable size, the largest of which have a diameter somewhat less than the thickness of the cuticle, and the smallest of which are very much smaller. The anus is slightly raised, and from it the rectum, which is one and one-half times as long as the anal body diameter, leads almost directly forward. The body tapers for some distance in front of the anus; from the anus onward it is conical to the acute terminus. There is no spinneret, and there are no caudal glands. Nothing definite is known concerning the renette cell. The excretory pore is located about half way between the median and posterior bulbs, just behind the oblique nerve-ring. The two uteri extend in opposite directions, and the ovaries are reflexed, the flexures occurring the one not far behind the base of the neck and the other not far in front of the anus. The mature females contain scores of eggs in various stages of development, the most advanced containing well-developed embryos.

63					
2.3	16.2	25.9	-M	96.3	I. mm.
1.9	3.4	3.5	3.7	2.6	

The tail of the male is conoid from the anus in such fashion that at the beginning of the posterior third it has become reduced to a mere striated nearly straight spine, which is no wider than one of the ribs of the bursa.

lower layers with high powers. There are short hairs to be found here and there on the surface of the body, more particularly toward the extremities. The conoid neck ends in a somewhat rounded head not set off by any constriction. The cephalic setae appear to be ten in number (eight submedian and two lateral), outward pointing, each about one-sixth as long as the head is wide, and placed on the outer margin of the front of the head opposite the posterior portion of the pharynx. The members of the submedian pairs are, however, of unequal size. There are six small, pointed lips surrounding the mouth opening. It is certain that these lips bear papillae, but the number is not known. Lateral organs in the form of somewhat stirrup shaped markings one-fourth as broad as the corresponding portion of the head, occur at a short distance behind the base of the rudimentary pharyngeal cavity. This latter is a more or less triquetrous cyathiform cavity having its walls distinctly chitinized and bearing at its base one or more protuberances near the point where the lumen of the oesophagus begins. One of these is a ridge, the others minute teeth. The average width of the main pharyngeal cavity is about one-third that of the head. The oesophagus is slightly expanded to receive the pharynx, but otherwise begins as a tube about three-fifths as wide as the anterior part of the neck, and expands very gradually to the end, where it is a little more than half as wide as the base of the neck. The lining of the oesophagus is a distinct feature throughout its length. There is a distinct rounded cardia. The intestine, which becomes at once about two-fifths as wide as the body, is separated from the oesophagus by a distinct constriction, in which lie the three granular bodies whose presence gave origin to the name of the genus. The intestine is relatively thick walled, its small cells containing scattered granules of small size, which are not arranged in any very definite manner. The intestine frequently contains diatoms in large numbers, thus indicating that these are a common source of nourishment for this species. From the slightly depressed anus the rectum, which is about as long as the anal body diameter, extends inward and forward to join the intestine, which is narrowed at its extremity so as to be about two-fifths as wide as the body. Nothing is known concerning the ventral gland. The longitudinal fields are distinctly developed, being about one-fourth as wide as the worm itself. The nerve-ring surrounds the oesophagus somewhat obliquely. The tail is conoid in the anterior third in such fashion that at the beginning of the middle third it has a diameter about one-fourth as great as at the anus. Thence onward it tapers gradually to the slightly swollen spinneret or outlet for the caudal glands. These latter, three in number, are located tandem in the tail opposite to and slightly behind the anus. From the slightly elevated vulva the vagina leads inward at right angles to the ventral surface fully half way across the body. The vagina is bifurcated and extends in opposite di-

rections, the reflexed ovaries passing about two-thirds the way back to the vulva. Two or three eggs may occur in each uterus at one time. These are somewhat ellipsoidal and thin shelled, being about two-thirds as long as the body is wide and about two-thirds as wide as long. The eggs appear to indicate at least the early stages of segmentation before being deposited. The walls of the vagina present the peculiarity of being very thick, and composed of concentric layers to the number of six or seven, so that the organ is considerably broader than it is deep. Its internal wall presents the peculiarity of staining strongly with carmine.

1.3	8.3	13.7	-M-	92.	
2.	2.6	3.2	3.8	2.7	1.2 mm.

The tail of the male is very much like that of the female in form and size. Supplementary organs are found in front of the anus only. These are six in number, of which three are very prominent. The anterior member of this group of three is about twice as far in front of the anus as the spinneret is behind it. The members of this group are equidistant, the distance between consecutive members being about twice as great as the diameter of the organs themselves. All three occupy a distance about twice as great as the corresponding body diameter. Each of these organs consists of an internal and an external portion, the internal portion being a flattish, hemispherical mass of tissue of very fine, or at least uniform texture. These have a diameter about two-fifths as great as that of the body at the same part. The external portion of these organs consists of a ring slightly raised, from which projects a mammiform papilla which bears a minute median seta or nerve-ending. When this mammiform portion is traced inward it passes through the ring on the surface of the body and then bends forward and ends rather indefinitely in the anterior contour of the internal portion of the organ. These organs possess the peculiarity of staining strongly with carmine. In addition to the organs already described there are three others of smaller size, two very minute, one near the anus and the other opposite the proximal portions of the spicula. The third, which has a size intermediate between those just described and those first described, is located about half way between the anus and the posterior member of the larger group. These smaller organs are comparatively close counterparts of the larger, differing merely in size. In addition it may be noted that the cuticle on the ventral surface of the male throughout this region of the body, that is, as far forward as the most anterior of these organs, bears about twenty exceedingly minute structures on the ventral line, which appear to be innervated papillae. These also stain strongly with carmine, although they are so minute as to be difficult to observe. There are no papillae on the tail, but there are several short hairs, more particularly near the ventrally submedian lines. There is no bursa. The ejaculatory duct is coextensive with the supplementary organs. It is on the average nearly half

as wide as the corresponding portion of the body. It is connected with the seminal vesicle by a narrow portion. The seminal vesicle is elongated, about half as wide as the body, and extends to a point about as far behind the neck as the base of the neck is from the anterior extremity. From this point the two nearly equal testicles extend in opposite directions, and end blind, one not far behind the base of the neck, and the other not far from the middle of the body. These possess the peculiarity of being slightly swollen at their proximal ends just where they join the vesicle. These swellings appear to constitute veritable cavities of small size. That region of the body corresponding to the ejaculatory duct is traversed by oblique striae, which, however, are arranged at right angles to the direction of such oblique striations as are found in other genera, and it is probable that they are connected with the duct itself, and are not muscles of the character which usually give rise to these oblique striations on the males of other genera. The two equal, arcuate slender spicula appear to be of rather uniform diameter when viewed laterally, and are one and one-half times as long as the anal body-diameter. Their proximal ends are cephalated by contraction. They are accompanied by accessory pieces two-fifths as long as the spicula themselves, and arranged parallel to the distal portions of the spicula.

Habitat: Mud, about the bases of aquatic plants, Potomac river, D. C.

MESOMERMIS, Dady.

Fig. 18, Plate VII. Fig. 24, Plate VIII.

27. *Mesomermis virginiana*, n.sp. $\frac{.8 \ 6.3 \ 11. \ -M- \ 96.}{1.3 \ 2. \ 1.8 \ 2.3 \ 2.2}$ $\frac{55}{1.8 \text{ mm.}}$

The rather thick, transparent, colorless layers of the naked cuticle are destitute of transverse striations. There are minute longitudinal striations throughout the body. These are interrupted on the lateral lines, where there is a distinct wing. The conoid neck becomes convex-conoid toward the lip region, which is not set off in any way. There are no cephalic setae, and there is no distinct pharynx. The mouth pore is very minute, and is a little toward the ventral side of the middle of the front of the head. The cuticle has about the same thickness on the head as elsewhere, being only a trifle thicker. The cuticle is penetrated on the head by a number of innervations. These end in minute depressions on the surface of the head. Near the mouth opening there is one of these depressions on the dorsal side, and apparently a similar one on the ventral side, while nearer the outer margin of the head there are two ventrally submedian and two dorsally submedian similar depressions. Pores occur also here and there on the body as well as on the neck. There are no eye-spots. The lateral organs present the

following appearance when seen from the side: They appear to project from the surface of the body very slightly, beginning as a tube having a length about one-third as great as the corresponding diameter of the head. This tube has very thin walls, and a short distance in, apparently near the surface of the body, a second element appears in the form of a circle inside that representing the contour of the outer tube. This appears to constitute a sort of core in the midst of which are a number of refractive elements, resembling nerve fibers, which pass inward and backward toward the lumen of the oesophagus. Some of these elements are longer than others. The focus passing inward picks up one, then two, then several more, so that by the time a view is obtained that is wholly inside the body there are seen a half dozen or more of these elements. It is impossible in this view to pick up an internal connection of these refractive elements. The oesophagus begins just below the transparent cuticle as a very narrow tube, probably not more than one-eighth as wide as the corresponding portion of the neck. It continues to have this diameter until after it passes through the nerve-ring. At a distance from the nerve-ring equal to about one body diameter, the oesophagus begins to change gradually into intestine. The intestine gradually widens out, so that at a point as far behind the nerve-ring as the neck is wide it has a width one-third as great as that of the body. It goes on increasing in this way until at a distance from the nerve ring three times as great it is two-fifths as wide as the body. Near its middle the intestine is half as wide as the body. The cells of the intestine contain granules of variable size, the largest having a diameter fully twice as great as the thickness of the cuticle, and the smallest being very minute. The female has not been seen. The tail of the male is slightly arcuate, and is conoid to the blunt, rounded terminus, which has a diameter half as great as that of the base of the tail. There is no spinneret, and there are no caudal glands. The lateral fields are about one-third as wide as the body. The nerve-ring surrounds the oesophagus somewhat obliquely. Nothing is known concerning the ventral glands or the excretory pore. The tail of the male bears several series of innervated papillae. These are sufficiently elevated at the surface of the cuticle to slightly break the contour when the tail is seen in exact profile. Where each nerve passes through the cuticle there is a very low, almost imperceptible elevation at the surface. These papillae are arranged on the ventral submedian lines as well as on the ventral line. The ventral papillae just in front of and just behind the anus are double. As to particulars of the submedian group, there are four on the tail, one member opposite the anus; one a little farther back, a third near the middle of the tail, and a fourth considerably farther back. In front of the anus on each side are eight submedian papillae. These occupy a distance more than twice as great as the length of the tail, and the distance between successive papillae in-

EXPLANATION OF PLATES*

PLATE II.

Fig. 1. *Iota octangulare*, n. sp. Lateral view of a female specimen. *a*, lip region; *b*, labial chitinous plate or expansion; *c*, protruding muscles of the spear; *d*, spear; *e*, trilobed base of the spear; *f*, lumen of the oesophagus; *g*, nerve-ring; *h*, beginning of the intestine; *i*, flexure in the single narrow ovary; *j*, excretory pore; *k*, ventral row of modified cuticular elements; *l*, submedian row of modified cuticular elements; *m*, ovum; *n*, muscular layer; *o*, anterior extremity of the uterus; *p*, uterus; *q*, cuticle; *r*, vulva; *s*, submedian row of modified cuticular elements; *t*, rectum; *u*, anus; *v*, terminus.

Fig. 2. *Rhabdolaimus minor*, n. sp. I, lateral view of female; II, head of the same, showing amphid. The head in I is twisted, so that the amphid appears as if ventral, or nearly so.

a, amphid; *b*, long, narrow pharynx; *c*, anterior group of nerve cells; *d*, nerve-ring; *e*, cardiac bulb; *f*, wall of the intestine; *g*, flexure in anterior ovary; *h*, posterior group of nerve cells; *i*, body cavity; *j*, lumen of intestine; *k*, ovum; *l*, blind end of posterior ovary; *m*, egg; *n*, flexure in posterior ovary; *o*, cuticle; *p*, caudal glands; *q*, subcuticle; *r*, vulva; *s*, rectum; *t*, anus; *u*, nerve cells (?); *v*, duct of caudal glands; *w*, spinneret; *x*, lip region.

Fig. 3. *Diplogaster fictor*, Bastian. I, side view of female; II, head of the same seen in dorso-ventral view, lips nearly closed; III, head of the same, lateral view, lips nearly wide open; IV, head of the same, lateral view, lips partially closed; V, front view of mouth, partially closed; VI, lateral view, posterior portion of a male specimen; VII, somewhat diagrammatic perspective view showing markings of the cuticle.

a, one of the lips; *b*, one of the six cephalic setae; *c*, amphid; *d*, one of the two more or less evertible pharyngeal hook-shaped teeth; *e*, median oesophageal bulb; *f*, nerve-ring; *g*, anus; *h*, rectum; *i*, intestine; *j*, terminus; *k*, posterior oesophageal bulb; *l*, nerve cells; *m*, renette cell (?); *n*, left spiculum; *o*, lumen of the intestine; *p'*, preanal male seta; *p''*, *p'''*, *p''''*, post-anal male setae and papillae; *q*, one of the cells of the intestine; *r*, accessory piece; *s*, flexure in anterior ovary; *t*, blind end of anterior ovary; *u*, longitudinal striae of the cuticle; *v*, vagina; *w*, synapsis in egg in the anterior uterus, the reduced number of chromosomes being seven; *x*, one of the spermatozoa in the ovary; *y*, uterus; *z*, vulva.

*The drawings are used by permission of the Secretary of Agriculture, and were made by Mr. W. E. Chambers, under the author's supervision.

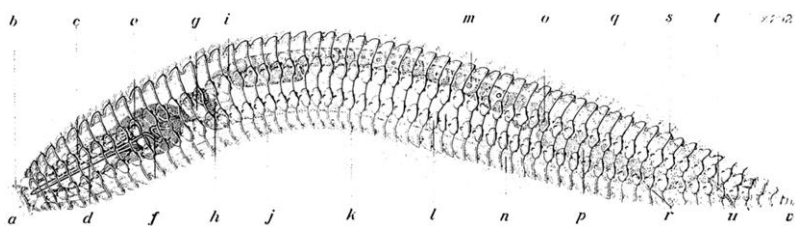


Fig. 1. *Lota octangulare*, n. sp.

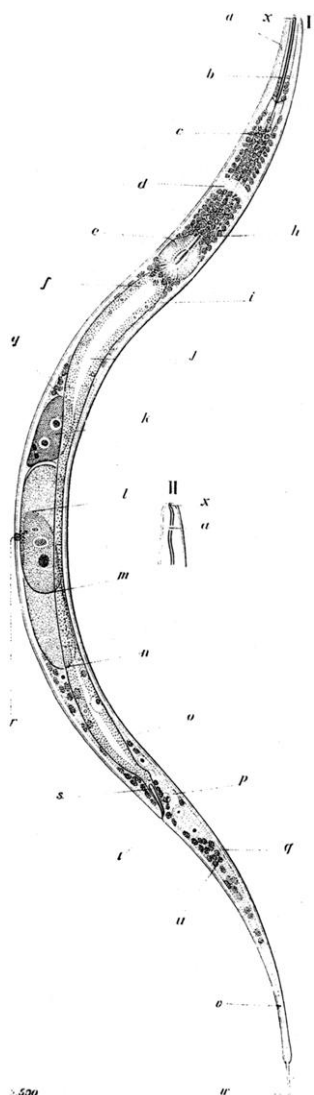


Fig. 2. *Rhabdolaimus minor*, n. sp.

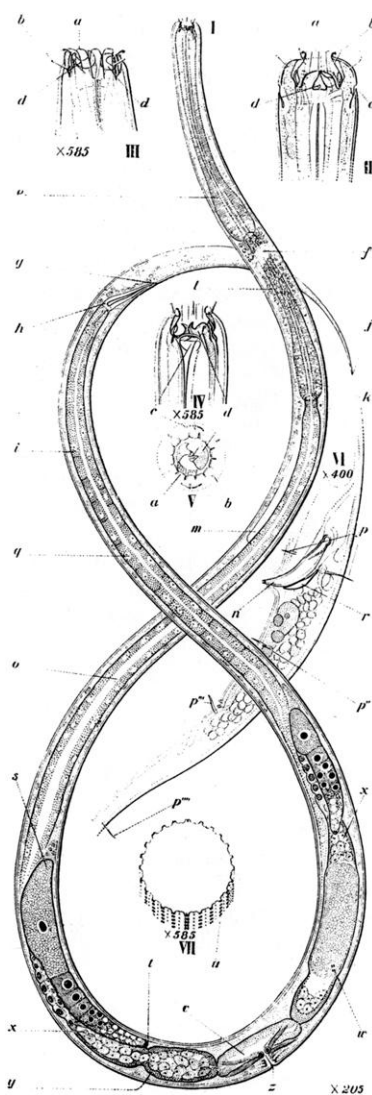


Fig. 3. *Diplogaster fector*, Bastian.

PLATE III.

Fig. 4. *Prismatolaimus stenurus*, n. sp. I, lateral view of a female; II, front view of head; III, side view of head.

a, one of the six cephalic papillae; *b*, one of the ten cephalic setae; *c*, one of the six thin lips; *d*, pharynx; *e*, amphid; *f*, lumen of the oesophagus; *g*, nerve-ring; *h*, cuticle; *i*, nucleus of ovum; *j*, vulva; *k*, blind end of posterior ovary; *l*, egg; *m*, beginning of the intestine; *n*, one of the cells of the wall of the intestine; *o*, rectum; *p*, anus; *q*, one of the caudal glands; *r*, flexure in anterior ovary; *s*, spinneret.

Fig. 5. *Spilophora canadensis*, n. sp. Side view of male.

a, one of the lips; *b*, dorsal pharyngeal tooth partly exserted; *c*, pharynx; *d*, base of the pharynx; *e*, lumen of the oesophagus; *f*, nerve cells; *g*, nerve-ring; *h*, excretory pore; *i*, chitinous valve of the cardiac bulb; *j*, one of the two lateral, longitudinal rows of cuticular markings; *k*, lumen of the intestine; *l*, renette cell; *m*, nucleus of renette cell; *n*, cell accessory to the renette cell; *o*, blind end of single testis; *p*, point in the cuticle where the striation is reversed; *q*, vas deferens; *r*, one of the spicula; *s*, anus; *t*, one of the caudal glands; *u*, spinneret.

Fig. 6. *Microlaimus fluxiatilis*, n. sp. I, lateral view of female; II, head of the same.

a, Mouth opening; *b*, one of the six cephalic papillae; *c*, one of the four cephalic setae; *d*, one of the small pharyngeal teeth; *e*, excretory pore; *f*, spiral amphid; *g*, oesophagus; *h*, nerve-ring; *i*, cardiac bulb; *j*, preliminary portion of the intestine; *k*, renette cell; *l*, body cavity; *m*, lumen of intestine; *n*, one of the cells of the intestine; *o*, anus; *p*, flexure in posterior ovary; *q*, uterus; *r*, blind end of posterior ovary; *s*, one of the three caudal glands; *t*, spinneret; *uu*, eggs; *v*, vulva; *w*, cuticle.

Fig. 7. *Tripyla lata*, n. sp. Lateral view, male specimen.

a, cephalic seta; *b*, one of the three lips; *c*, amphid; *d*, spermatozoa; *e*, spermatocytes in anterior testis; *f*, posterior extremity of the oesophagus; *g*, nerve-ring; *h*, cuticle; *i*, oesophagus; *j*, lumen of oesophagus; *k*, intestine; *l*, spermatocytes in posterior testis; *m*, one of the numerous ventral male papillae; *n*, vas deferens; *o*, retractory muscle of spiculum; *p*, one of the spicula; *q*, lumen of the intestine; *r*, duct of one of the caudal glands; *s*, caudal gland; *t*, spinneret.

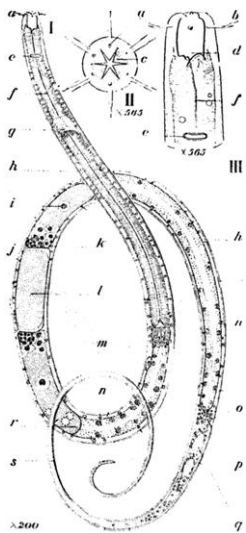


Fig. 4. *Prismatolaimus stenurus*, n. sp.

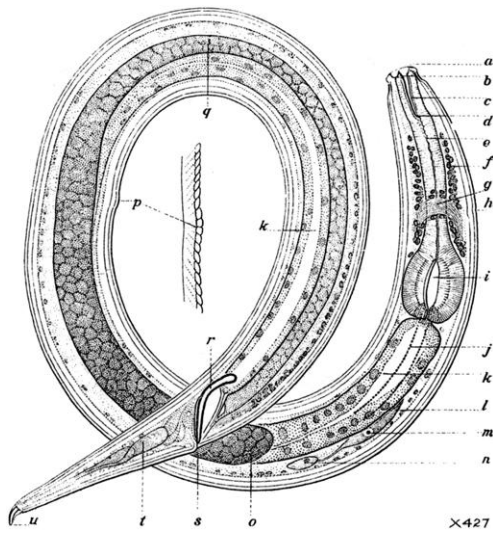


Fig. 5. *Spilophora canadensis*, n. sp.

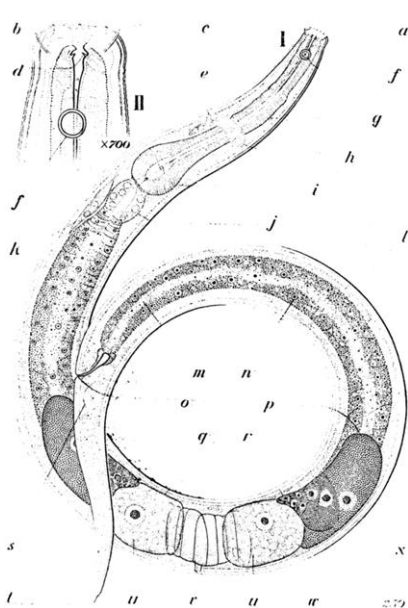


Fig. 6. *Microlaimus fluviatilis*, n. sp.

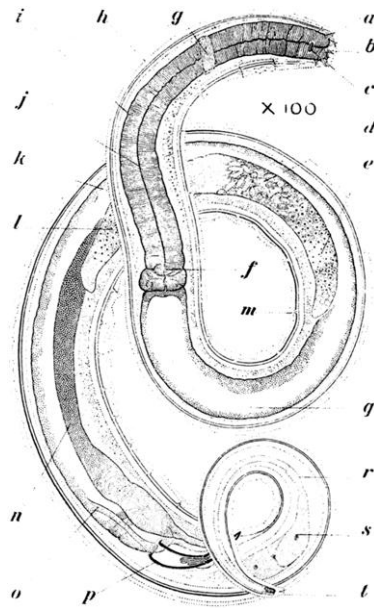


Fig. 7. *Tripyla lata*, n. sp.

PLATE IV.

Fig. 8. *Tetratocephalus cornutus*, n. sp. I, lateral view of a female; II, lateral view of head, more highly magnified; III, front view of head; IV, dorso-ventral view showing lips wide open; V, cuticle showing lateral field.

a, one of the six movable, chitinous lips; *b*, one of the four submedian cephalic setae; *c*, amphid; *d*, nerve-ring; *e*, excretory pore; *f*, organ of unknown significance; *g*, cardiac bulb; *h*, intestine; *i*, anus; *j*, rectum; *k*, cuticle; *l*, one of the cells of the intestine; *m*, lumen of the intestine; *nn*, flexures in ovary; *o*, egg; *p*, vulva; *q*, blind end of posterior ovary; *u*, terminus.

Fig. 9. *Alainus simplex*, n. sp. I, lateral view of a female; II, anterior extremity, lateral view; III, posterior extremity of a male, lateral view.

a, lip region; *b*, pharynx; *c*, amphid; *d*, amphid, enlarged; *e*, group of spermatozoa at the posterior portion of the ovary; *f*, blind end of ovary; *g*, male supplementary papillae; *h*, left spiculum; *i*, terminus; *j*, rudimentary submedian elevation or flap of the cuticle, indicating rudimentary bursa; *k*, egg; *l*, vulva; *m*, nerve-ring; *n*, posterior extremity of oesophagus; *p*, modified cells of anterior portion of the intestine; *q*, cuticle; *r*, wall of the intestine; *s*, lumen of the intestine; *t*, flexure in the single ovary.

Fig. 10. *Plectus tubifer*, n. sp. Male specimen, lateral view.

a, lips; *b*, papilla-like cephalic seta; *c*, amphid; *d*, anterior chamber of pharynx; *e*, posterior chamber of pharynx; *f*, lumen of the oesophagus; *g*, nerve-ring; *h*, excretory pore; *i*, renette cell; *j*, cardiac bulb; *k*, vulva of cardiac bulb; *l*, cardia; *m*, lumen of intestine; *n*, blind end of anterior testis; *o*, spermatocyte; *p*, junction of testes; *q*, blind end of posterior testis; *r*, beginning of vas deferens; *s*, spermatozoon; *t*, male glands; *u*, one of the caudal glands; *v*, anterior of the three tubular supplementary organs; *w*, spicula; *x*, anus; *y*, one of the nine male papillae; *z*, spinneret.

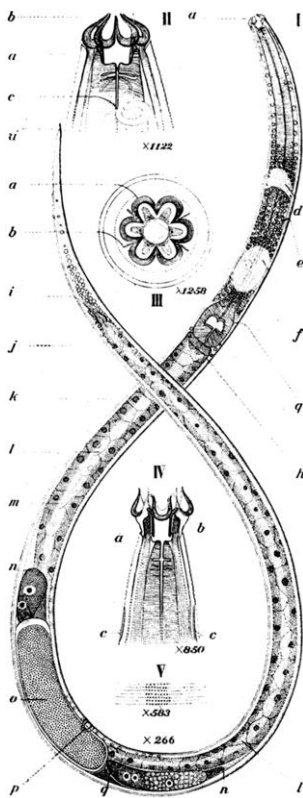


Fig. 8. *Teratocephalus cornutus*. n. sp.

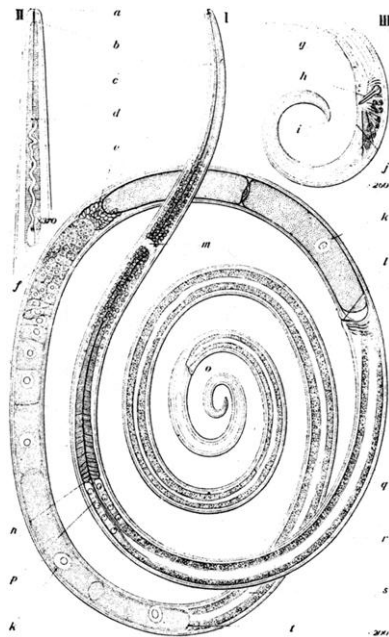


Fig. 9. *Alaimus simplex*, n. sp.

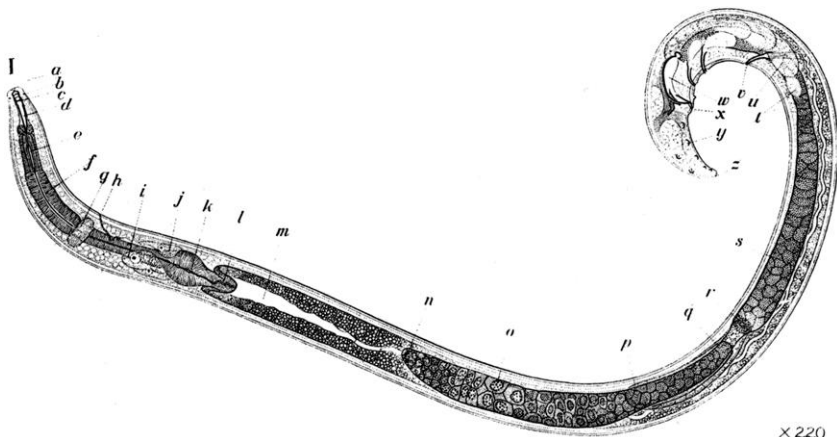


Fig. 10. *Plectus tubifer*, n. sp.

PLATE V.

Fig. 11. *Achromadora minima*, Cobb. I, lateral view of a female; II, lateral view showing cuticular markings; III, lateral view of head.

a, cephalic papilla; *b*, cephalic seta; *c*, one of the ribs of the pharynx; *d*, dorsal pharyngeal tooth; *e*, sub-ventral (?) pharyngeal tooth; *f*, pharynx; *g*, cuticular markings; *h*, amphid; *i*, nerve cell; *j*, nerve-ring; *k*, spinneret; *l*, excretory pore; *m*, flexure of ovary; *n*, one of the caudal glands; *o*, blind end of posterior ovary; *p*, anus; *q*, intestine; *r*, vulva; *s*, one of the granules of the intestine; *t*, egg.

Fig. 12. *Dorylaimus fecundus*, n. sp. Side view of head and tail of female, and tail of male.

a, spear or onchus; *b*, one of the six anterior cephalic papillae; *c*, one of the six posterior cephalic papillae; *d*, guiding ring of the spear; *e*, oesophagus; *f*, intestine; *g*, rectum; *h*, anus; *i*, one of the anal muscles; *j*, one of the four lateral caudal, innervated papillae; *k*, cuticle; *l*, subcuticle; *m*, muscular layer; *n*, wall of the intestine; *o*, one of the numerous oblique ejaculatory muscles; *p*, one of the numerous ventral male papillae; *q*, ejaculatory duct; *r*, one of the two preanal papillae; *s*, retractor muscle of one of the spicula; *t*, muscular layer; *u*, right spiculum; *v*, right accessory piece.

Fig. 13. *Ironus americanus*, n. sp. I, anterior extremity, lateral view, oral organs everted; II, same, more highly magnified; III, anterior extremity of a specimen about to moult, showing two sets of oral organs, the anterior set in process of being replaced by the posterior; IV, posterior extremity of a female, lateral view.

a, one of the three chitinous oral teeth; *b*, cephalic papilla; *c*, cephalic seta; *d*, amphid; *e*, pharynx; *f*, anterior group of minute pharyngeal teeth; *g*, posterior group of pharyngeal teeth; *h*, oesophagus; *i*, lining of oesophagus; *j*, nerve-ring; *k*, intestine; *l*, anus; *m*, base of the tail; *n*, terminus.

Fig. 14. *Oncholaimus punctatus*, n. sp. Lateral view of head and tail of male specimen.

a, terminal flaps of lips; *b*, lip; *c*, cephalic papilla; *d*, one of the papilla-like cephalic setae; *e*, right submedian onchus; *f*, left submedian onchus; *g*, wall of pharynx; *h*, intestine; *i*, ejaculatory duct; *j*, one of the spicula; *k*, dorsal onchus; *l*, amphid; *m*, duct of oesophageal gland leading into onchus; *n*, rectum; *o*, beginning of the oesophagus; *p*, anus; *q*, lining of the oesophagus; *r*, one of the caudal glands; *s*, one of the two male papillae; *t*, ducts of the caudal glands; *u*, spinneret.

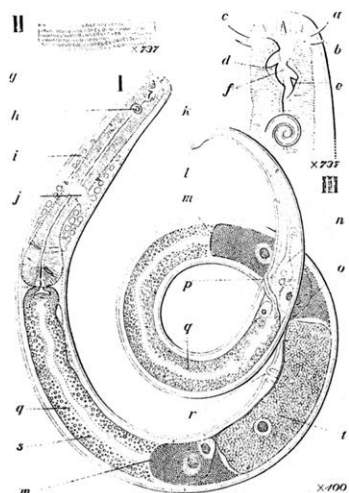


Fig. 11. *Achromadora minima*, Cobb

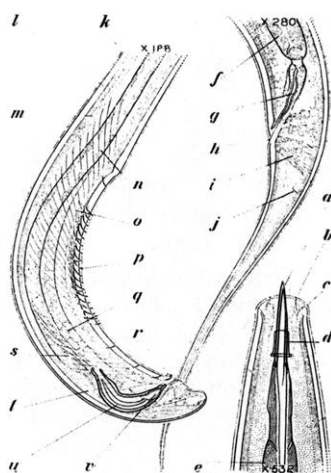


Fig. 12. *Dorylaimus fecundus*, n. sp.

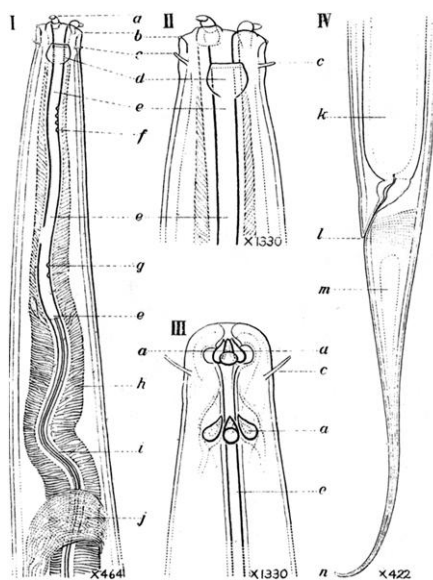


Fig. 13. *Ironus americanus*, n. sp.

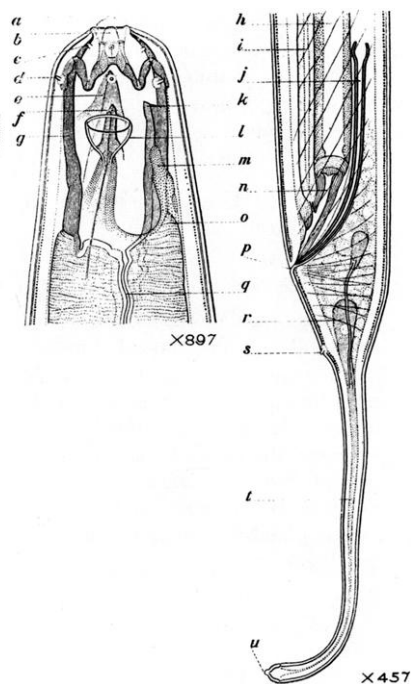


Fig. 14. *Oncholaimus punctatus*, n. sp.

PLATE VI.

Fig. 15. *Trilobus longus*, (Leidy), Bastian. I, male specimen, lateral view; II and III, head of the same, lateral view; IV, head, dorso-ventral view; V, VI, and VII, enlarged views of the ventral supplementary organs.

a, lateral cephalic seta; *b*, cephalic papilla; *c*, submedian cephalic setae; *d*, pharynx; *e*, amphid; *f*, anterior pharyngeal tooth; *g*, posterior pharyngeal tooth; *h*, oesophagus; *i*, nerve-ring; *j*, excretory pore; *k*, nerve cells; *l*, glandular (?) organs; *m*, lumen of intestine; *n*, blind end of anterior testis; *o*, testis; *p*, junction of testes; *q*, blind end of posterior testis; *r*, vas deferens; *s*, anterior male supplementary organ of the anterior series; *t*, anterior supplementary organ of the posterior series; *u*, spicula; *v*, accessory piece; *w*, caudal gland; *x*, anus; *y*, terminus; *z*, nerve ending of papilla of the supplementary organ.

Fig. 16. *Dolichodorus heterocephalus*, n. g., n. sp. I, nearly side view of a female; II, lateral view of surface of head, more highly enlarged; III, sagittal section of head; IV, dorso-ventral view of head; V, front view of head; VI, side view, posterior extremity of male; VII, ventral view of posterior extremity of female; VIII, ventral view of posterior extremity of male.

a, papilla; *b*, cephalic organ of unknown significance; *c*, spear; *d*, base of spear; *e*, median bulb; *f*, nerve-ring; *g*, excretory pore; *h*, cardiac swelling; *i*, intestine; *j*, anus; *k*, lateral caudal pores; *l*, terminus; *m*, blind end of posterior ovary; *n*, ovary; *o*, left spiculum; *p*, accessory piece; *q*, distal end of accessory piece; *r*, left flap of bursa; *s*, terminus of male; *t*, ovum; *u*, spermatozoa; *v*, vaginal muscles; *w*, uterus; *x*, vulva; *y*, anus.

Fig. 17. *Cyatholaimus truncatus*, n. sp. I, side view of a female; II, side view of head; III, front view of the same head; IV, ventral view of anal region of male; V, lateral view of the same; VI, lateral view in the middle of the body showing cuticular markings and pores.

a, submedian cephalic seta; *b*, labial papillae; *c*, amphid; *d*, dorsal tooth; *e*, lateral cephalic seta; *f*, one of the twelve ribs of the vestibule; *g*, small submedian pharyngeal tooth; *h*, base of the pharynx; *i*, ejaculatory duct; *j*, intestine; *k*, one of the four male pre-anal supplementary organs; *l*, one of the spicula; *m*, anal muscles; *n*, one of the accessory pieces; *o*, nerve-ring; *p*, one of the cells of the intestine; *q*, lumen of the intestine; *r*, anus; *s*, blind end of reflexed ovary; *t*, egg; *u*, vulva; *v*, flexure in anterior ovary; *w*, junction of the ovary and uterus; *x*, pores in the cuticle; *y*, one of the three caudal glands; *z*, male gland (?).

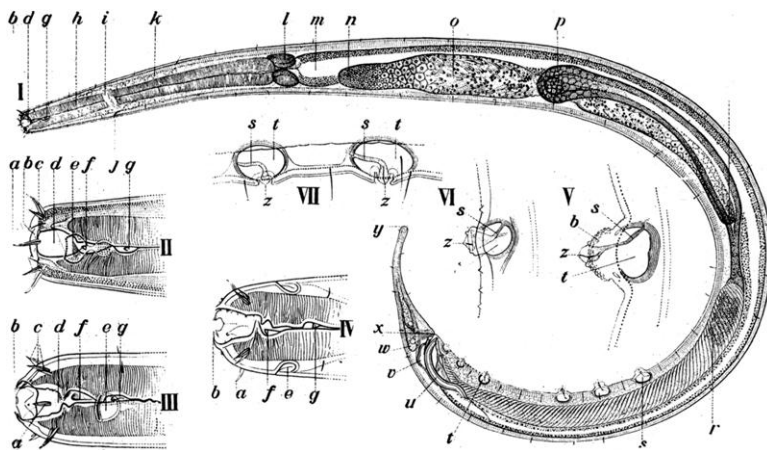


Fig. 15. *Trilobus longus*, (Leidy), Bastian

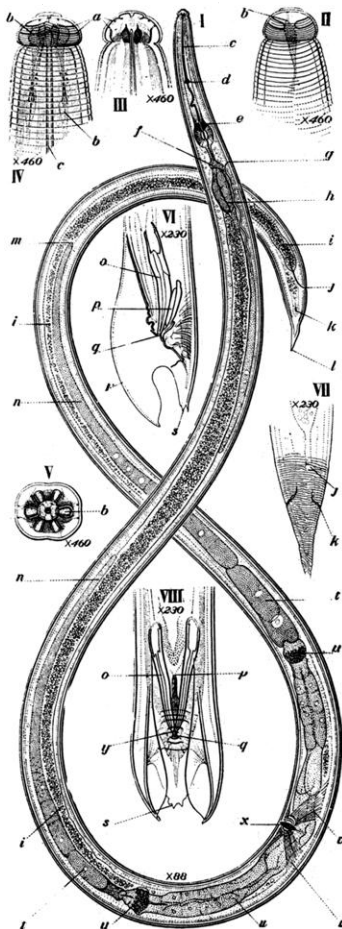


Fig. 16. *Dolichodoros heterocephalus*,
n. g., n. sp.

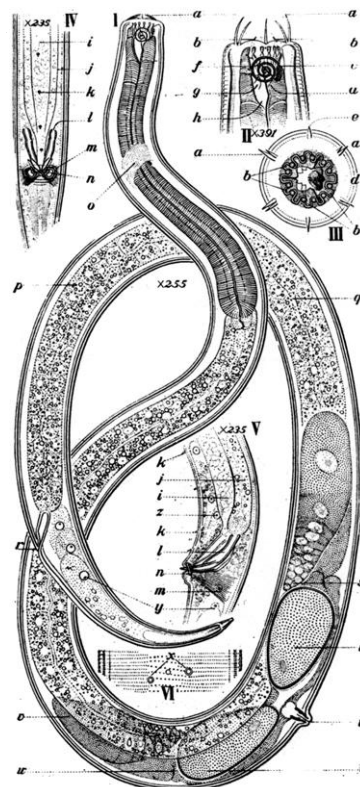


Fig. 17. *Cyatholaimus truncatus*, n. sp.

PLATE VII.

Fig. 18. *Mesomermis virginiana*, n. sp. Lateral view of head and tail.

a, mouth opening; *b*, one of the anterior rows of cephalic papillae; *c*, one of the posterior row of cephalic papillae; *d*, pharynx; *e*, exterior of amphid; *f*, interior of amphid; *g*, oesophagus; *h*, innervated papilla; *i*, glandular cephalic organs; *j*, nerve-ring; *k*, lumen of oesophagus; *l*, intestine; *m*, ejaculatory duct; *n*, body cavity; *o*, oblique copulatory muscles; *p*, one of the submedian supplementary organs; *q*, one of the median supplementary organs; *r*, spicula; *s*, one of the median post-anal supplementary organs; *t*, final submedian supplementary organs; *u*, submedian supplementary organ.

Fig. 19. *Ethmolaimus americanus*, n. sp. Lateral view of a female.

a, lips; *b*, minute dorsal and ventral pharyngeal teeth; *c*, one of the four cephalic setae; *d*, amphid; *e*, pharynx; *f*, nerve-ring; *g*, excretory pore; *h*, nerve cells; *i*, cardiac bulb; *j*, beginning of the intestine; *k*, renette cell (?); *l*, beginning of main portion of the intestine; *m*, one of two pairs of unicellular organs of unknown significance; *n*, cuticle; *o*, one of the cells of the intestine; *p*, subcuticle; *q* and *r*, body cavity; *s*, vulva; *t*, nuclei of one of the muscle cells; *u*, spinneret; *v*, one of the caudal glands; *w*, anus.

Fig. 20. *Monhystera sentiens*, n. sp. I, side view of a female; II, side view of head of the same; III, side view of posterior extremity of a male.

a, pharynx; *b*, submedian cephalic seta; *c*, lateral cephalic seta; *d*, spermatozoon; *e*, amphid; *f*, lining of oesophagus; *g*, oesophagus; *h*, subcephalic setae; *i*, lumen of intestine; *j*, nerve cells; *k*, nerve-ring; *l*, striated lip region; *m*, left spiculum; *n*, glandular structure associated with amphid; *o*, blind end of single ovary; *pp*, the three caudal glands; *q*, anal muscles; *r*, spinneret; *s*, beginning of intestine; *t*, anus; *u*, one of the cells composing the intestine; *v*, vulva; *w*, egg, the spermatozoa "*d*" being outside of the egg "*w*"; *x*, egg in synapsis; *y*, vaginal glands; *z*, ovum.

Fig. 21. *Oncholaimellus heterurus*, n. sp. I, side view of head; II, ventral view of head; III, side view of tail end of male; IV, ventral view of anal region of male.

a, excretory pore; *b*, submedian cephalic seta; *c*, pharynx; *d*, left flap of bursa; *e*, oesophagus; *f*, left spiculum; *g*, accessory piece; *h*, amphid; *i*, male post-anal seta and papilla; *j*, lateral seta; *k*, spinneret; *l*, thin lips.

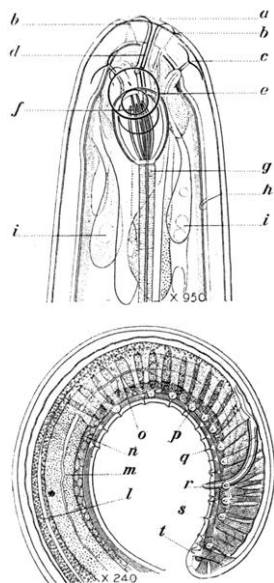


Fig. 18. *Mesomermis virginiana*, n. sp.

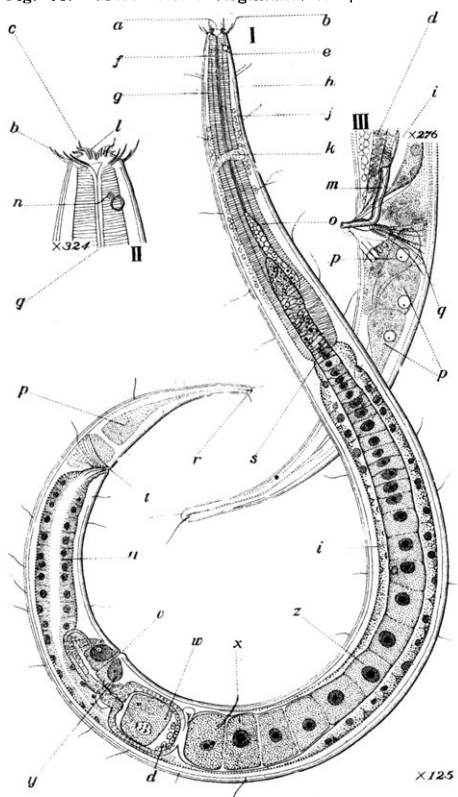


Fig. 20. *Monhystra sentiens*, n. sp.

PLATE VII.

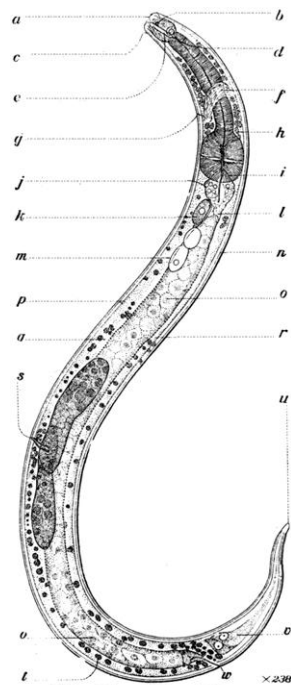


Fig. 19. *Ethmolaimus americanus*, n. sp.

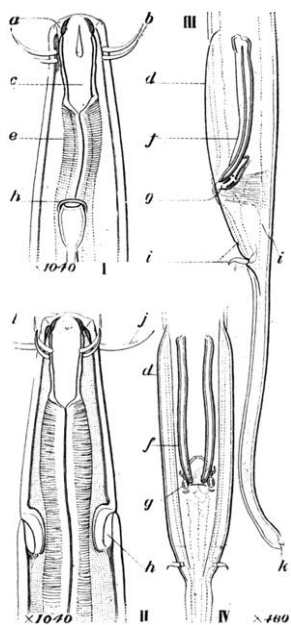


Fig. 21. *Oncholaimellus heterurus*, n. sp.

PLATE VIII.

Fig. 22. *Cephalobus sub-clongatus*, n. sp. Lateral view of a female.

a, lips; *b*, pharynx; *c*, anterior portion of oesophagus; *d*, posterior extremity of anterior portion of oesophagus; *e*, nerve-ring; *f*, cardiac bulb; *g*, beginning of intestine; *h*, one of the cells of the intestine; *i*, lumen of the intestine; *j*, excretory pore; *k*, cardiac valve; *l*, renette cell; *m*, flexure in single ovary; *n*, cuticle; *o*, ovary; *p*, spermatozoon in uterus; *q*, vulva; *r*, nucleus in ovum; *s*, body cavity; *t*, anus; *u*, ripe ovum; *v*, unripe ovum; *w*, oöcyte; *x*, blind end of ovary; *y*, rectum; *z*, terminus.

Fig. 23. *Bastiana exilis*, n. sp. Lateral view of a male specimen.

a, one of the six cephalic papillae; *b*, one of the posterior set of four submedian cephalic setae; *c*, one of the anterior set of six cephalic setae; *d*, oesophagus; *e*, cervical seta; *f*, amphid; *g*, one of the cells of the intestine; *h*, one of the numerous male supplementary organs; *i*, blind end of the two testes; *j*, nerve-ring; *k*, posterior extremity of oesophagus, (pseudo-bulb); *l*, left spiculum; *m*, cuticle; *n*, spermatozoon; *o*, anal muscle; *p*, treminus; *q*, vas deferens; *r*, intestine.

Fig. 25. *Aphanolaimus spiriferus*, n. sp. I, lateral view, anterior extremity of a female; II, lateral view, posterior extremity of a female; III, lateral view of head, more highly magnified; IV, one of the male supplementary organs; V, lateral view of posterior extremity of male.

a, mouth opening; *b*, amphid; *c*, lumen of oesophagus; *d*, pigmented eyespot (?); *e*, intestine; *f*, nerve-cell; *g*, rectum; *h*, nerve-ring; *i*, anus; *k*, oesophagus; *l*, caudal gland; *m*, duct of one of the caudal glands; *n*, glandular body at base of neck; *o*, spinneret; *p*, ejaculatory duct; *q*, intestine; *r*, anterior end of cloaca; *s*, right spiculum; *t*, backward pointing accessory piece; *u*, nerve-cells (?); *v*, one of the numerous male supplementary organs.

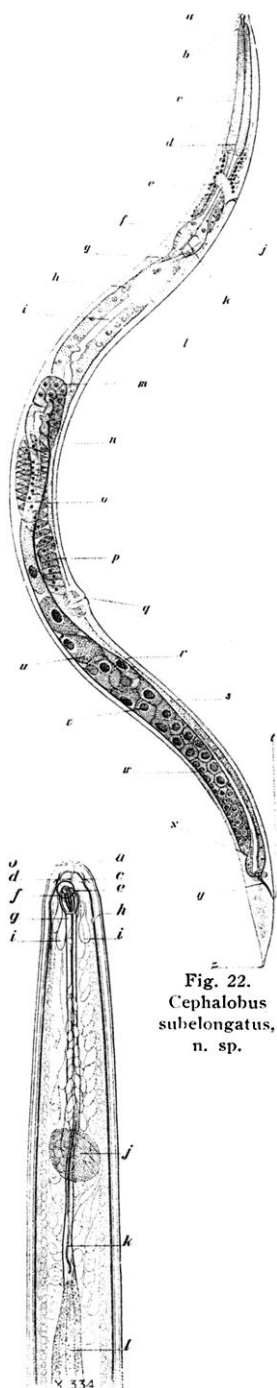


Fig. 22.
Cephalobus
subelongatus,
n. sp.

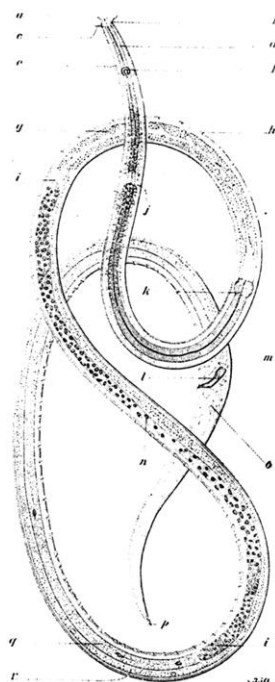


Fig. 23. Bastiana exilis, n. sp.

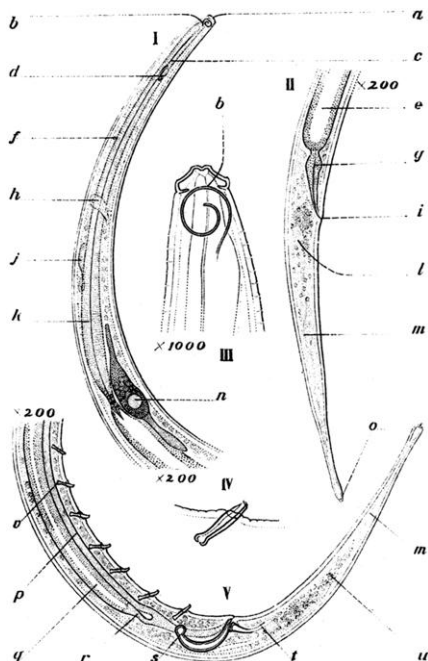


Fig. 24. Mesomermis virginiana, n. sp.

Fig. 25. Alphanolaimus spiriferus, n. sp.